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OLD AGE

SOME PRACTICAL POINTS IN GERIATRICS AND GERONTOLOGY

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AND
GERONTOLOGY

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PREFACE TO THE SECOND EDITION

Apart from two chapters and portions of a third, this book has been entirely rewritten. Thanks to the generosity of the Nuffield Foundation, who provided a research grant, the writer was enabled to spend three years continuing the investigations commenced at the Royal Hospital, Chelsea. Most of this work has been done at St. John's Hospital, Battersea, with the permission of the London County Council, who kindly provided clinical and pathological facilities. A great deal is owed to the help and advice of Dr. A. P. Piggot, without whom the sections dealing with morbid anatomy could never have been completed. Thanks are also due to the *British Medical Journal, The Lancet, Geriatrics, The Journal of Gerontology, The Practitioner,* and *The Medical World* for permission to use material first published in their columns.

Since there has recently been a great increase in the attention paid to the care of the elderly and chronic sick, it is hoped that the matter included in this book may be of some assistance to those whose work lies in that field of medicine.

T. H. H.

PREFACE TO THE FIRST EDITION

THE observations on which this book is founded were made while acting as Deputy Physician and Surgeon at the Royal Hospital, Chelsea. Several of the chapters are based on articles written from various medical journals. In particular, it is desired to thank the Editor of the *Postgraduate Medical Journal* for permission to reprint Chapters I and X, the *British Medical Journal* for Chapter VIII, the *British Heart Journal* for Chapter IV, the *Practitioner* for Chapter VI, and the *British Journal of Physical Medicine* for Chapter V. Thanks are also due to the War Office and the Commissioners of the Royal Hospital, Chelsea, for their permission to publish this book, dealing as it does, with Chelsea pensioners.

Although the observations made were of a purely clinical nature, it is to be hoped that one or two of them may be of some value when added to the small number of facts which make up our present knowledge of old age.

T. H. H.

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OLD AGE

CHAPTER I

APPROACH TO OLD AGE

DURING the next fifty years, old age and its diseases are going to be among the most serious problems which medicine must face. In 1947 there were five million people in this country over the age of 65, while in 1977 there may be more than eight million, according to the report of the recent Royal Commission on Population. Since the aged suffer more from disease and therefore consult their doctors more frequently than the young, it is obvious that serious thought must be given to the problems of health and sickness in the elderly. As the report mentioned above states :—" A strong and sustained effort will be needed to meet the varied needs of the growing numbers of the old for accommodation and care." From the medical point of view, this effort must start from two sources. First, a knowledge of the normal changes in body and mind which make up senescence : this is Gerontology. Second, a study of the way in which elderly persons react to disease and the best methods of treating their maladies : this is Geriatrics. Some of the more advanced American writers on old age suggest that the real time to benefit elderly persons is the two or three decades before they reach sixty. While this is somewhat of an exaggeration, it stresses the vital importance of prevention in the management of aged patients, since the cure of established senile diseases must always remain difficult.

Besides this medical approach, we must also consider the social background of our ageing population. Men and women of more than seventy can be regarded as the survivors of an obsolete or expended previous generation. Many of their contemporaries have died, leaving them solitary and sometimes friendless. In some instances they have no relatives ; in others their children have grown up, married and left the parents. This is the basis for that feeling of loneliness which afflicts so many elderly people. Since the aged do not readily make new personal contacts to replace old ones, the same circumstances when added to the natural diminution in ability to perform physical work create a mental impression of uselessness. The combination of these two ideas causes the elderly to feel that they are not wanted, that they are a burden to others and that the days of their personal significance or importance are over. When the growing physical limitations are added to these mental disabilities, it is not difficult to account for the irritability, touchiness and general unhappiness of so many elderly people. As they are no longer easily able to earn money, they may have an element of financial insecurity at the back of their minds, although this is less than it was formerly owing to social factors such as old age pensions and the provisions of the national health service. They may have to contend with changing conditions of life, move to a smaller house, take responsibilities formerly shouldered by their children or spouse at a time when adaptation is no longer easy. This is often a great mental strain to them and can sometimes precipitate the onset of senile psychoses.

On the psychological side, old age brings a gradual loss of mental flexibility. Recent events do not make their mark deeply upon consciousness unless they are associated with pain or unhappiness. The mind tends to dwell more and more in the past rather than the present. Certain trains of thought and corresponding verbal phrases recur without remembrance of recent utterances. The old man tells the same story several times over, forgetting that he has done so before. Later, his conversation may take the form of a limited number of phrases which are repeated time and again. These may be likened to a stock of gramophone records which are played in succession. Over a period of months or years, some of these records get scratched or even broken, so the remainder have to serve more often. Of course, some elderly people retain their mental alertness and are capable of acquiring fresh impressions. Many, however, although quite rational, have perception which is dull and mental processes which are slower than those of younger persons. There may be actual intolerance of new ideas or merely inability to absorb them. While the process of learning is not impossible in old age, it is extremely laborious and most fatiguing to the mind. Many elderly folk will not make the effort which is necessary unless they have a previous habit of regular continued personal education. Hence, while the aged can continue to live happily in familiar surroundings under conditions to which they are habituated, any sudden alteration may act as a mental trauma. The writer has known examples of this, such as the case of an elderly lady who had to leave her own home and live with first a daughter and then a son. After each move to a new house, there was a period of mild confusion and restlessness. Each change resulted in the mind operating on a lower level, so that a person who had formerly run her own home became unable to find either her bedroom or the lavatory in new surroundings. Similarly it is not unknown for patients to die suddenly without obvious cause soon after transfer from one hospital to another. In the original institution their condition has often remained the same for several years : immediately the old persons are placed in different surroundings they deteriorate.

This problem of psychology in old age has, of course, several practical aspects. It is advisable, for example, not to try and segregate the elderly in dwellings and colonies apart from the remainder of the community. Since loneliness and mental apathy are often precursors of senile dementia, there is a great deal to be said for the practice of visiting old people in their own homes, interesting them in the outside world, persuading them to join in social activities and so on. In hospitals for the aged, it is noteworthy that those patients who perform occupational therapy improve mentally as well as physically. In their own homes, it is the old folk who get out and about who preserve their faculties the best. This has an important bearing on the policy which should be followed in hostels for the aged. Those institutions in which the inmates are expected to sit still and keep quiet eventually create an atmosphere of apathy and mental stagnation which can be recognized at sight by an experienced observer. Those in which activity of body and mind is encouraged develop a much happier and healthier set of old people. The contrast between the Chelsea pensioners, (who are expected to conform to mild military discipline, encouraged to undertake light duties in the Royal Hospital, provided with their own " bunk " where they can keep their own possessions, and entitled to a plot of garden) and the inmates of certain public assistance institutions is amazing. On the one hand there are happy healthy human beings, who take pride in themselves and their appearance. On the other, an apathetic, dull and torpid collection of bodies resembling a herd of animals, whose only interest is in their meals. Of course, there is every gradation between these two extremes, even under the same local authority. There is a tendency at present to consider that small hostels are preferable to large institutions. The optimum number of inmates has been taken at thirty by some experts. If only 1 per cent. of the population is to need institutional care, this means 70,000 souls, who would fill more than 2,000 such hostels. To staff these adequately might be a difficult problem. My experience at Chelsea makes me certain that there is a place for larger centres holding about 500 persons, which can become economical but happy homes for old people.

Institutional care, however sympathetic, is only a poor second best for the elderly. They are happiest in their own homes, surrounded by their own possessions, close to their own friends and relations. Our policy should be to keep them there as long as possible. Social services, such as " home helps," " meals on wheels" and the like can do a great deal to remove the stresses and strains from their existence when infirmity overtakes them. Hospital out-patient clinics for old folk can often deal with the minor medical and surgical complaints which are beyond the scope of the general practitioner. Admission to hospital should be regarded as a medical confession of failure, unless it is for the purpose of some special investigation or treatment. In the same way, it might be considered that admission of an old person to a hostel or institution should be regarded as a confession of failure on the social side, unless there is a domestic or family lesion as an indication. We must never forget that the aged are human beings like ourselves, not a race of creatures apart. They have anatomical, physiological and psychological differences from the young: their reactions to disease are not the same. Our task is to allow for these factors and to give our old folk the help which they need and deserve in both social and medical fields.

CHAPTER II

CARE, COMFORT AND MANAGEMENT

THE difficulties which arise in the care of old persons who are not ill, may be divided into those which originate in the relatives or attendants and those involving the patient himself. The former tend to mollycoddle their victim and to regard him as lacking in common sense. They forget that old age is not always synonymous with delicate health and stupidity. In practice it is often necessary to show that patience, cheerfulness and a simple joke at times, can help an old man or woman to lead an almost normal life until the end is quite near. Fussing, pampering or bullying only create misery for all concerned by making the old person confused and helpless earlier than need be. It is important to keep a proper perspective when considering the woes of the aged ; making light of minor complaints is better than maximising them. Anything tending to produce self-pity must be avoided, so that sympathy is to be administered sparingly. It makes a poor tonic for old folk. Also a frequent recital of complaints to the nurse or doctor is to be checked, since they gradually grow in the mind of the patient during the telling.

It is important to remember that an old person considers himself something of an authority on living by reason of reaching his present age. Experience has probably taught him a suitable routine, which should not be changed drastically if it can be avoided. Moderation and regularity are the two ideals at which to aim in the management of old people. As George Cheyne put it in 1725 : " No voluptuous or lazy person, unless he has had an original constitution of Brass, was ever a long Liver . . . . All those who have lived long and without much Pain, have lived abstemiously, poor and meagre." Many elderly folk eat more than is necessary. The resultant increase of fat is not beneficial to their health. At the same time, partly by natural disinclination and partly by mistaken advice from relatives, they diminish their usual amount of exercise. Eventually they take to their bed for good and go downhill much more quickly, both in body and mind, than those who remain active. It cannot be stressed too firmly that immobility leads to stagnation and decay of mental and physical qualities. Senescence needs contact with the outside world and stimulation rather than suppression and sedatives. The wireless, books and newspapers help to keep men and women alert and to enliven the monotony which threatens them. Thus hobbies and occupations are to be encouraged. It is noteworthy, in the Royal Hospital, Chelsea, that the fittest veterans are the men who keep their own plot of garden and who enjoy a game of bowls. Transition from active occupation to complete retirement, without industry or interests, often spells early atrophy and death.

Some of the habits of old persons are liable to need modification, however. Such matters as fresh air, bathing, clothing and the use of alcohol may require consideration and adjustment sooner or later. The senescent should be encouraged to take fresh air and exercise daily unless the weather is very unsuitable. By doing so, he will probably find that he has lost the desire to add more and more jerseys, vests and waistcoats in an attempt to keep warm. It is usually the sedentary old man with masses of garments who complains most of " feeling the cold." The matter of alcohol needs to be considered with care. A glass or two of beer each day does not seem to have any ill-effects, even in patients with rheumatic diseases. At night an ounce of whiskey is often a useful sedative, especially in those not accustomed to the use of spirits. But heavy drinking by old men often has more immediate ill-effects than in younger persons, with more hepatic, renal and cerebral reserve. Bathing is another matter which needs consideration at times. Many old folk grow averse to having a bath as they get on in years. They should be reassured that regular bathing is good for their health, or they may become incredibly dirty. On the whole, the basic principle of a regular normal routine should be followed as nearly as possible.

SICKNESS

Apart from the actual treatment of disease in old persons, a great deal can be done to improve their condition by attention to their comfort when they are not well. It is very easy for an elderly person to get into an uncomfortable position and be unable to remedy matters. One of the first duties of an attendant is to change the posture of the patient from time to time, preferably with some assistance from another person. If the case becomes " chesty," transference from bed to an armchair often improves the condition by allowing better expansion of the lungs. In all cases where it is possible, without detriment to the patient, it is advisable to have him out of bed for part of the day. The effects, both physical and psychological, are beneficial even if the change is only for a few minutes. Remaining in one position will lead to pressure and disturbance of local circulation. Bed-sores and other atrophic changes follow, probably caused by ischaemia which is the chief and classical basis of so much senile pathology.

Regulation of the patient's bowels is a point which is certain to need consideration sooner or later. Old people are not always reliable witnesses in this matter, so their statements are best confirmed. When laxatives are given, liquid paraffin or paraffin emulsion can be made the starting point. If this is not enough, a drachm of liquid extract of cascara may be added to the ounce of paraffin with benefit in most cases. When a variant is desired, one or two vegetable laxative tablets may be given. Salts are not unsuitable for the aged, given in plenty of hot water and followed by a cup of tea or coffee. Mist. Senna Co. is another useful preparation which is more efficacious when followed by a hot drink. As far as possible, the stronger purgatives should be avoided. When the drugs enumerated have failed, it is better to give a simple enema. Sometimes it takes a little while to find which laxative is most suited to a patient and some loose stools may be produced. In such cases, and for transient diarrhœa, it is convenient to use a mixture of three parts of Pulv. Creta Arom. cum Opio with five of Kaolin. The elderly often have difficulty in using a bedpan with ease. They are happier with a commode or night stool which can be placed beside their bed for use when necessary. This gives the minimum of disturbance and exertion to both patient and attendant ; it also eliminates a psychological cause of constipation.

With regard to drugs other than laxatives, most old people need full doses to produce the desired effect. This is especially true of sedatives and hypnotics. A restless arteriosclerotic patient will often need 30 grains each of chloral hydrate and sodium bromide to produce sleep. Sometimes barbiturates or drugs like medinal and allonal are better in such cases. Opium and morphia may be given to the elderly in normal doses when required. With belladonna and others of the Solanaceæ, however, care is needed, since toxic symptoms may arise with even moderate amounts. Hence,.in bronchitis with spasm, it is better to give adrenaline or ephedrine, rather than the usual anti-spasmodic mixture, which is, incidentally, less effective. In cases with congestive heart failure, digitalis is apt to be rather disappointing and to produce nausea easily. More reliance should be placed on the virtues of mersalyl for immediate use than in younger patients, especially if there are signs suggesting pulmonary œdema. Of the analeptics, the most useful seems to be nikethamide (coramine). This may be used as a stimulant in cardio-respiratory distress or with toxæmic myocardial failure following an acute infection such as pneumonia. In the latter condition it is the only drug which seems to be of value, and far superior to digitalis when given hypodermically in doses of 2-5 c.c. twice or thrice a day. Where elderly patients are concerned, the sulphonamide group of drugs should always be exhibited early in the course of an infection and in full doses. Procrastination and timidity lead to myocardinal toxæmia and fatal cardiac failure—much commoner in senility than with younger patients.

On the whole, it may be stated that there is no need to withhold alcohol from the aged patient. If he is used to it, he will suffer from deprivation ; if he is not, it will usually act as a valuable sedative and vaso-dilator. Whiskey and brandy have a place in the treatment of a slowly developing painful new growth. They lessen the need for morphia injections if given periodically during the day, and make the last days of the patient less wretched than would otherwise be the case.

Old people prefer to take drugs in liquid form rather than as tablets. The latter may have to be crushed and given in milk or some other drink. Also pills and tablets are often absorbed less effectively than fluids. Gargling is not performed well by the senile, so that sprays or lozenges are preferable forms of medication. As the veins of many old persons are very mobile, the intravenous route should be avoided for injections. Reaction to irritating solutions outside the vessel wall is a more serious matter than is the case with younger patients.

There is no need to be afraid of the results of surgery in the aged, provided that the dangers of a fall of blood pressure and of shock are not forgotten. Emergency laparotomy has saved the lives of many elderly patients with intestinal obstruction. The value of palliative surgery in malignant disease of the œsophagus, colon or rectum needs careful consideration, however. It does not always give the prolongation of life and freedom from discomfort which is expected.

Physiotherapy has an important place in the treatment of old people. Heat, in one form or another, is a beneficial form of relief for the minor injuries and infections usual in old age. The fibrositis and osteo-arthritis common in the aged also get ease and improvement from heat and massage. Very often the physiotherapist can help a patient so that he remains up, active and about, instead of becoming bed-ridden, crippled or a " chronic."

THE DYING

Sooner or later there comes a point in the management of a senile patient when the physician realises that he can do no more than ease the terminal stages of life. This last phase may have a duration of minutes, days or months, according to the nature of the case. It is often accompanied by a gradual fall of blood pressure and the diminution of muscular tone throughout the body. Sometimes mental confusion or obscurity becomes obvious as the first sign of approaching dissolution. Delusions and an increasing nocturnal restlessness are often seen in cases of cardio-vascular failure, accompanied by signs of peripheral ischæmia. Sudden bed sores, darkening of the skin of the heels and incontinence of urine and fæces are milestones on the way to death in those cases which, as Clifford Hoyle puts it, are " dying by inches." An increasing weariness in the facial expression may be noticed as the first sign of a change for the worse, or else numerous complaints of minor discomforts and pains in a patient previously stoical. When indications such as these are noted, interference with the patient should be reduced to the minimum. Unnecessary investigations or surgical interference should be eschewed, and the doctor ought to concentrate on alleviation of distress rather than systematic treatment.

Opiates, sedatives and hypnotics properly used will do much to ease the last days of the senile patient. There is no danger that the sufferer will become addicted to the drugs used, but sometimes there is a danger that the doses employed will not be sufficient to allay discomfort. Opium and morphia are the drugs of choice where pain or dyspnœa are present. Either may be given by mouth when prolonged action is desired. The use of morphia with hyoscine in cases with restlessness and irritability is beneficial not only to the patient, but to anxious relatives around him. Soluble barbiturates, such as amytal sodium, nembutal and somnifaine are also valuable hypnotics where pain is not a predominant part of the clinical picture. The fact that they can be given by injection is a great point in their favour. Depression, so often seen in chronic cardiac patients and slowly growing cancers, may be abolished by alcohol, as previously noted. Clifford Hoyle suggests the use of cocaine in such cases, as being of considerable value. So-called "stimulants," such as camphor in oil, adrenalin, etc., have no place in the treatment of the dying. It is nothing more than the infliction of useless discomfort to administer them.

The cardinal points in the nursing care of the dying are comfort, cleanliness, warmth and prevention of thirst. During the last stages of weakness, it is more necessary than ever to change the position of the patient from time to time. Pressure points need constant attention. The heels are often best kept from contact with the bed by ring pads or a pillow placed under the ankles. Air rings help to prevent bed-sores if carefully arranged, but care must be taken not to leave a gap between the ring and the pillows. Another point to watch is the placing of the pillows so that the head does not loll and fall forward when the patient drops off to sleep. Bed-socks often give comfort if not too tightly fitting. Hot water bottles must be placed with care, since old people are easily burnt. They should be out of reach of the patient's hands, to avoid meddling. Often they are more beneficial when applied to the thigh than when placed at the soles of the feet.

Cleanliness is most important, and should include the toilet of the mouth and eyes as well as the more obvious parts of the body. As the end approaches, old people have not the strength to lift a cup to their mouth. The attendant must see that they get enough fluids, as thirst is one of the sensations of the dying. Even a moist swab in the mouth gives comfort to those who are unable to swallow. It is not necessary to force solid feeding on those *in extremis*, provided that they get sufficient liquid. Some patients, apparently unconscious, are still able to hear what is said around them, so that a guarded tongue is desirable. If consciousness is retained to the end, it is only kind for some relative or attendant to remain with the dying person to the last, so that they may have companionship on their road. As morphia should not be withheld from the dying, so they should not be deprived of any mental or spiritual consolation. Noise or fussing is inexcusable, as the patient should be spared every discomfort, mental as well as physical. When there is little more which can be done for an old person whose race is nearly run, let that little be done with care, kindness and reverence.

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CHAPTER III

NORMAL TEMPERATURES IN OLD AGE

THERE is a difference of opinion about the normal temperature in old age.

Since the experiments of Davy in 1845, 98·4°F has been taken as the normal adult level. On the Continent, however, 37°C (98·6°F) is accepted. Bard (1941) states that there is a normal diurnal variation of 1·8°F, the lowest temperature being found in the early morning and the highest in the late afternoon.

In a review of temperature changes among the aged, Martsinkovski and Zhorova (1936) cite Barensprung (1851), Charcot (1881), and Landois (1894) to the effect that the aged have a temperature higher than that of normal adults, and Schlesinger (1914) that the internal temperature is maintained at the usual level with slight variations. Cannon (1942) quotes Hirsch (1926) as agreeing with this. His own opinion is the same, " but the limits of adaptation tend to become gradually norrower as one passes through the seventh decade of life." Thewlis (1946) disagrees : " In old age, however, temperature may be below normal."

The present study, designed to test these opinions, tends to support Thewlis.

The first step in the investigation was to take some preliminary readings for exactly ½ min. with a ½ min. thermometer possessing a certificate of accuracy from the National Physical Laboratory. The subjects of the experiment were Chelsea pensioners in the infirmary of the Royal Hospital without any febrile disorder.

TABLE 1.—*Mean Mouth Temperatures (°F) by age*

Age (years)	No. of persons	1 min.	3 min.	5 min.	Difference
Under 70	4	97·2	97·5	97·7	0·5
70–74	11	96·1	96·9	97·4	1·3
75–79	12	95·6	96·3	96·7	1·1
80–84	4	96·0	96·8	97·0	1·0
Over 85	4	96·5	97·0	97·4	0·9

TABLE 2.—*Mean Axillary Temperatures (°F) by age*

Under 70	5	95·3	95·8	96·0	0·7
70–74	11	95·6	96·0	96·5	0·9
75–79	6	96·1	96·9	97·2	1·1
80–84	6	95·6	96·6	96·9	1·3
Over 85	2	95·9	96·1	96·7	0·8

The readings were begun in July. Several of the temperatures did not reach 95° the lowest reading on the instrument. These were however, reckoned as 95° for purposes of calculation of the pilot series. This result was subsequently confirmed in patients in the chronic wards of St. John's Hospital, Battersea, where 25 out of 100 readings registered less than 95°F. These readings were made in October.

Wright (1940) considers that the thermometer should be in place for 10 min. to ensure a correct reading. Few feeble elderly people, however, can hold a thermometer properly in place for more than 5 min. I therefore took successive readings lasting 1, 3, and 5 min. to find out whether the temperature reading was higher when the thermometer was kept in longer. This series of tests was undertaken in 35 pensioners with the thermometer in the mouth, and 30 with it in the axilla. The results were grouped according to age, and the mean figures are shown in tables 1 and 2. As stated above, readings below 95°F have been taken as 95° for the purpose of calculation. This renders the 1 min. results a trifle high, since 6 axillary and 3 mouth temperatures did not register.

TABLE 3.—*Mean 5 min. Temperatures (°F) by age groups*

Age (years)	No. of persons	Mouth	Axilla
65–69	36	98·0	96·9
70–74	146	97·8	96·6
75–79	81	97·9	96·7
80–84	40	97·7	96·6
85–89	20	97·7	96·6
90–95	3	96·9	96·3
Total ...	326	...	...

Since the 5 min. temperatures were all below the customary standard, it was decided to compare them with a similar series of readings in healthy adults. Consequently, 5 min. temperatures were taken in 50 nurses (male and female) of St. John's Hospital. The mean mouth temperature of these controls was 97·83°F and the mean axillary temperature 97·03°F. The lowest mouth temperature recorded was 95·6°F, and the highest 98·6°F. The lowest axillary reading was 95·0°F, and the highest also 98·6°F. The range in the mouth, therefore, was 3° and in the axilla 3·6°.

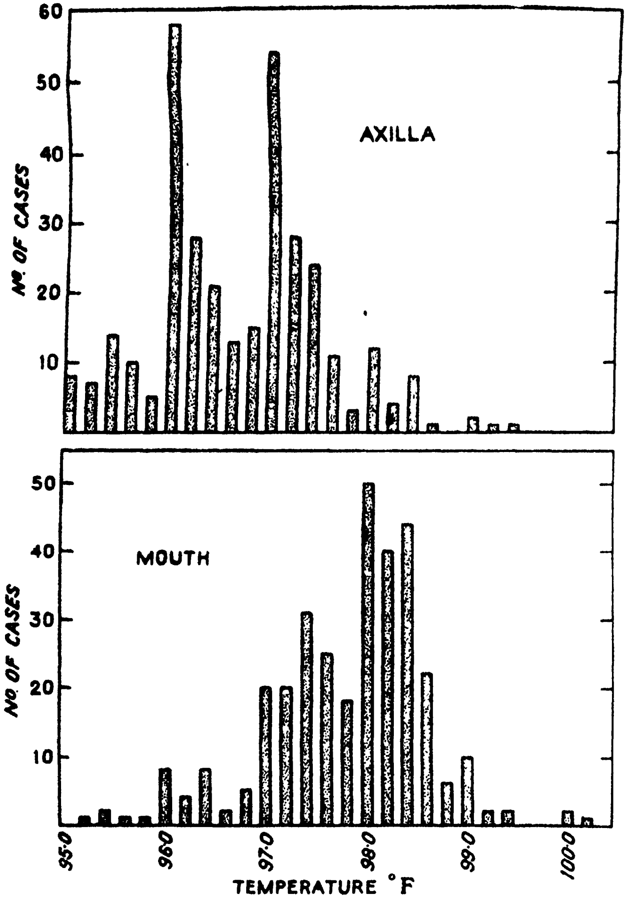

Fig. 1. — Temperature ranges in axilla and in mouth in Chelsea pensioners

In view of these findings it was decided to measure the 5 min. temperatures of a larger number of healthy Chelsea pensioners simultaneously in mouth and axilla. All the men in this series were aged more than 65, the oldest being 91. Each one was ambulant, and none was in need of any medical treatment. All cases of illness were excluded. The readings were taken during nearly a year, 12 men being examined every week. The experiment formed part of a larger investigation into normal variations of temperature, pulse-rate, blood-pressure, arterial thickening, and other physical signs commonly found in old age. The men were always examined between 10.30 and 11.30 a.m. as part of the routine weekly medical inspection of the fit and healthy pensioners. They had always had a period of rest before examination.

Among the 326 old men considerable variations were found in the temperature readings of mouth and axilla. The mouth temperatures showed a range of 5°, from 95·2°F to 100·2°F ; and the axillary temperatures varied from 95·0°F to 99·4°F—a range of 4·4° (see figure). The mean temperatures for the five-year age-groups were calculated for comparison with the results shown in tables 1 and 2, and are shown in table 3. Taken all together, the temperatures were somewhat lower than those found in normal adults and below those found in the previous control series.

It was felt, however, that the final figures for all 326 old men would be a truer picture of the real normal findings in old age.

Mouth Temperatures (°F)

	Mean	S.E. of Mean	Min.	Max.	Range
Controls	97·83	0·10	95·6	98·6	3·0
Series	97·81	0·04	95·2	100·2	5·0

Axillary Temperatures (°F)

	Mean	S.E. of Mean	Min.	Max.	Range
Controls	97·03	0·12	95·0	98·6	3·6
Series	96·67	0·04	95·0	99·4	4·4

Findings in 50 nurses and in 326 old men

It will be seen that the arithmetic mean thus calculated was 97·81°F in the mouth and 96·67°F in the axilla. The median reading of the series was 98·0°F in the mouth and 96·8°F in the axilla. The mode was the same as the median in the mouth, but 96.0° in the axilla (see figure). The maximal oral deviation was—2·6° in a man of 73, and the axilla showed +2.7° in a pensioner aged 70. The mean deviation was ±0.6° in the mouth and ±0.7° in the axilla. The variance was the same as the mean deviation in each case, which gave a standard deviation of 0·8° in the mouth and 0·8° in the axilla. I have not been able to find any similar set of figures for comparison.

SUMMARY

In old age, mouth and axillary temperatures taken for half a minute only are not accurate readings.

Few old people can retain a thermometer in place for more than 5 minutes.

In old age the range of normal temperature is greater than in earlier life.

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CHAPTER IV

THE PULSE RATE IN OLD AGE

During the eighteenth century physicians were obsessed by the diagnostic value of the radial pulse; during the nineteenth they were interested in it; during the twentieth they ignored it. Galen wrote sixteen essays on the pulse; Floyer wrote a book on the subject. Even in 1884 Fothergill could devote a chapter of twenty-eight pages to the topic but a recent handbook of clinical methods dismisses the matter in nine short paragraphs.

This declining interest is reflected most particularly in the literature on old age. Cowdry and Stieglitz make no reference at all to the pulse rate in advancing years. Thewlis merely states that bradycardia is often found.

In the preceding century, however, more data appeared. Balfour discusses the incidence of a slow pulse rate in apparently healthy persons. Humphrey gives us some statistics on this topic. Writing on the pulse rate of some 57 men between 90 and 100 years, he states, " average, little over 75 per minute." Concerning 280 men between 80 and 90 years, he tells us " average about 74 per minute . . . a large number had pulse rate below 70." Loomis, who studied under Charcot, thinks that the normal rate is between 60 and 70 beats per minute for old men, or between 68 and 78 for old women. Pinnock in a series of apparently normal old people, finds the average to be 71·8 beats per minute for men and 70·5 for women. Hourmann and Dechambre give 82·3 as the mean in 255 old women. Richerand and others, as quoted by Maclachlan, testify to the frequency of a very slow pulse in the elderly under their care.

In view of these variations and the lack of recent information about changes in the pulse rate with advancing years, an investigation was undertaken. The subjects were healthy, active Chelsea pensioners at the Royal Hospital, Chelsea, in London. All men with known cardiac disease or arrhythmias were excluded from the series. They were examined after a period of rest as part of a routine medical inspection. Thus emotional tachycardia was unlikely to be important. The ages of those examined ranged from 60 to 93 years, with the mean 74·55 years for the total of 335 old men. The age distribution is shown in table 4.

TABLE 4.—*Age Group Distribution of Subjects*

Age Group	Number
60–64	11
65–69	36
70–74	145
75–79	81
80–84	40
85–89	19
90–94	3
Total	335

Any unusually high or low figure was always checked a second time before being recorded. It was found, however, on going through the figures that a certain number of pulse rates had been timed for a quarter of a minute while the rest had been counted for half a minute. For this reason the number of men with a rate which is a multiple of four has been added to the number with a rate two greater (Fig. 2). The result is a much smoother gradation.

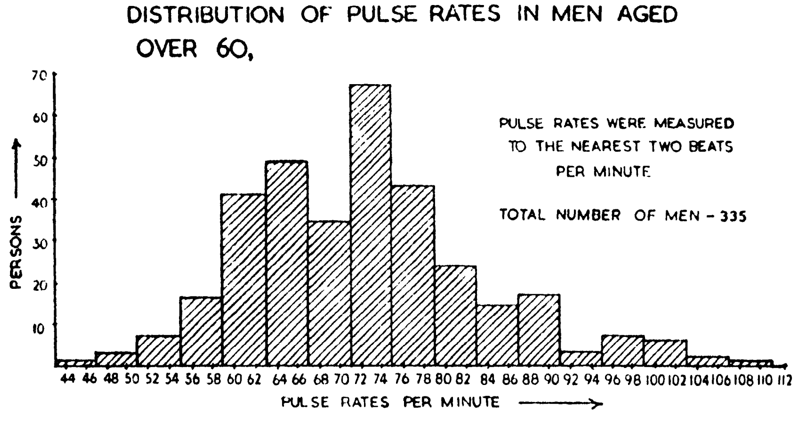
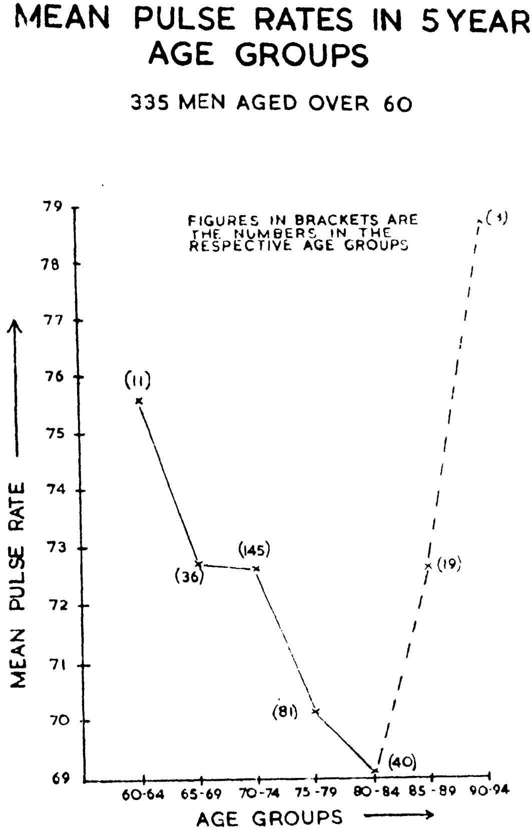


Fig. 2.

The distribution of pulse rates is shown in figure 2. It will be seen that there is a range varying from 44 to 108 per minute. Although this variation is considerable, it is not much greater than in a series reported by Burn, who examined a small group of medical students and found variation from 52 to 103 beats per minute. In the persioners of the present series the mean rate was 71·76, the mode 72, and the standard deviation 10.9 beats per minute.



MEAN PULSE RATES IN 5 YEAR AGE GROUPS

335 MEN AGED OVER 60

Fig. 3.

When the changes of pulse rate with advancing years were examined it was found that the mean pulse frequency diminished steadily between 60 and 84 years (Fig. 3). Over this age, however, the rate rose sharply. The relative numbers in the different age groups vary so much that the latter part of the curve will need further confirmatory investigation. The exact figures are given in table 5.

In view of these findings, correlation coefficients were calculated for first, the whole series ; second, the range 60 to 84 years ; third, 80 to 93 years. The results were (1)—0·081, (2)—0·137, (3) +0.200. Of these only the second is significant and unlikely to be merely the effect of a chance distribution in such subjects, The interpretation of these results is that the apparent fall of pulse rate with age over the range 60 to 84 years is a real one, although the connection is not very rigid. The apparent rise in the range 85 to 94 may not be a real one since it might easily have occurred by chance. It is sufficient to make it impossible to claim statistically that the fall of pulse rate with age applies to the whole range between 60 and 94 years.

The only reference which I have been able to find bearing on this point is Minot, who quotes Porter. The latter states that the mean frequency is from 60 to 65 years, 73 beats per minute ; 65 to 75 years, 75 beats per minute ; 75 to 80 years, 72 beats per minute, and over 80 years, 79 beats per minute. Since the number of observations upon which these findings are based is unknown they must be accepted with caution. Nevertheless, it is interesting to note the definite rise in the last age group.

This great variation of the pulse rate in old people is the explanation of the relative uselessness of pulse charts in trying to assess the onset of an acute infection. It had already been noted that the pulse rate varied from 76 to 108 in a small series of Chelsea pensioners admitted to the infirmary of the Royal Hospital with acute bronchitis. This rate on admission was found to have no bearing upon the severity of their disease nor the ultimate prognosis. In the same way that a temperature of 98·4 F. may indicate two or even three degrees of fever in an aged person, so may a pulse rate of 72 sometimes represent an appreciable tachycardia. It will thus be seen that the present investigation has more than an acadamic value.

TABLE 5.—*Pulse Rate and Age Groups*

Age Group	Mean Pulse Rate	Cases
60–64	75·6	11
65–69	72·7	36
70–74	72·6	145
75–79	70·1	81
80–84	69·1	40
85–89	72·6	19
90–94	78·7	3
Overall mean	71·76	335

SUMMARY

1. The resting pulse rate of 335 healthy Chelsea pensioners has been recorded.

2. The range of frequency varied from 44 to 108 beats per minute.

3. The mean pulse rate fell between 60 and 84 years but rose again after that age.

4. The mean of the whole series was 71·76 beats per minute; the mode was 72 beats; the standard deviation was 10·9 beats.

5. The clinical implications of these findings are pointed out.

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CHAPTER V

THE HAEMOGLOBIN LEVEL IN OLD AGE

In the past, many writers have stated that the level of haemoglobin in the blood of old people is diminished. At the same time, it has been taught that the patient who suffers with emphysema and chronic bronchitis will show a high figure for haemoglobin content. As part of an investigation into bronchitic manifestations, a control series of haemoglobin readings was carried out on elderly patients who did not suffer from the disease. The unexpected result showed rather high average figures, so it was decided to compare these findings with those of other recent investigators in senile haematology.

LITERATURE

Among the older writers, Lorand quotes Naunyn as saying: " Old people are anemic." Saundby gives the customary count for red blood cells as 3·6 millions and considers that the haemoglobin is reduced in proportion. Boas has said, " Persons over sixty have somewhat lower values for haemoglobin than do those of younger ages." Millet and Balle Hellears mention several workers who found the haemoglobin to be lower than normal, but point out that many of the investigations were carried out on sick persons.

Among more recent authors, however, Isidore Miller quotes Nascher and Wintrobe as seeing no significant alteration. Lichenstein and Williamson are both mentioned as finding a fall about the age of 60 with a rise in extreme old age. His own series of 160 men showed a slight diminution in both red cells and haemoglobin. Olbrich does not agree with this and quotes several workers who all found normal or high levels among elderly people. These are summarized in Table 6.

PRESENT SERIES

The present figures were derived from two sources: First, the control group already described, including 52 man and 63 women in St. John's Hospital, Battersea. They were patients

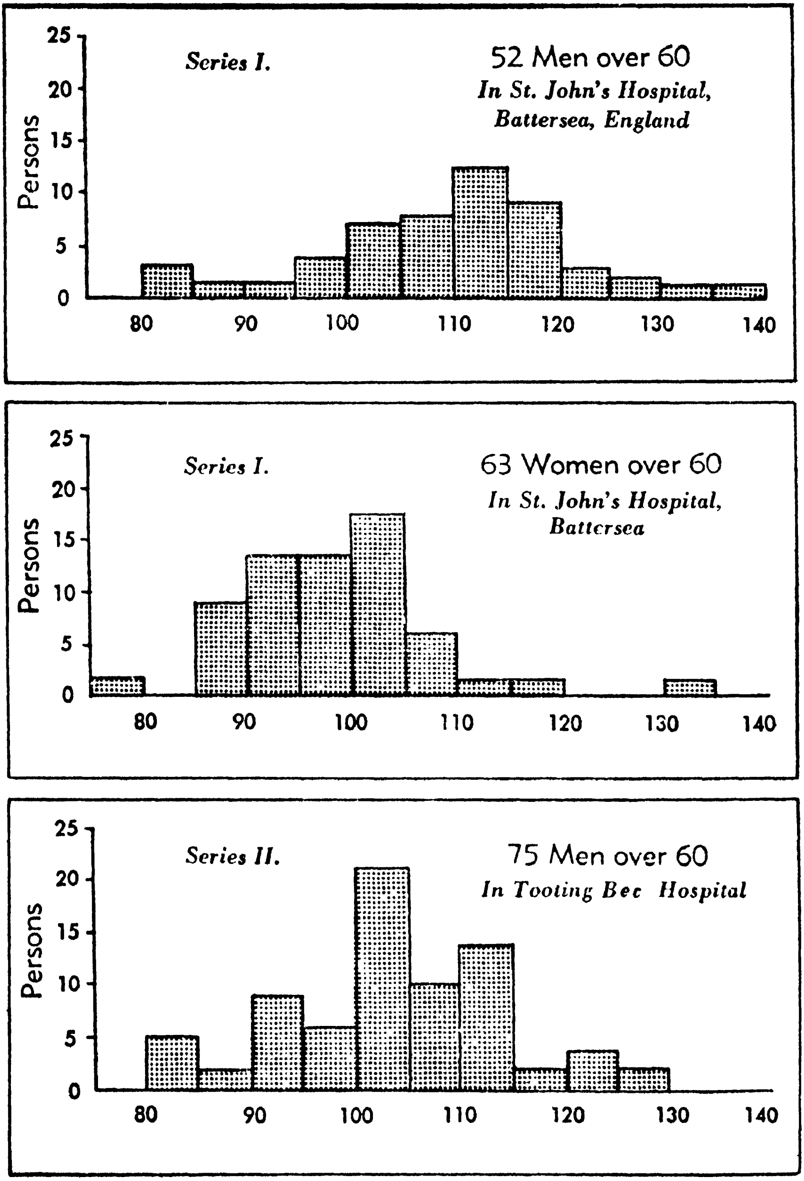

Fig. 4. — Haemoglobin per cent.

in this chronic hospital who did not suffer from known anemia or chronic bronchitis. Those with new growths were also excluded. The estimation of haemoglobin was carried out in the

TABLE 6.—*Estimates of Haemoglobin in old age.*

Author	Haemoglobin % Male	Haemoglobin % Female	Grams/100 cc. Male	Grams/100 cc. Female	Grams/100 cc. Both
Isaacs	...	...	14·22	14·15	...
Stephenson, et. al.	89	...	...	...	...
Wintrobe	...	...	...	...	16·0
Millet and Balle Hellears	...	...	...	...	13·3
Miller	...	...	14·3	...	...
Cameron and Nicholson	...	...	15·66	15·37	...
Nelson and Stoker	...	...	...	...	15·5
Fowler, et. al.	...	...	13·1	...	...
Newman and Gitlov	...	...	12·7	11·7	...
Medical Research Council Committee	98·7	...	...	...	...
Olbrich	100·7	94·6	13·9	13·2	13·5

wards by the author, using a Sahli haemoglobinometer and waiting ten minutes before starting dilution of the blood. Most of these patients are known to be hypertensive. The second group of cases was made up of 75 men over sixty years old in Tooting Bec Hospital for patients with senile dementia. The estimations were performed by Dr. R. F. L. Hewlett, pathologist at Lambeth Group Laboratory, using the Haldane method.

TABLE 7.—*Haemoglobin in old age, Series 1 St. John's Hospital*

	Males				Females			
Age	No.	Maximum	Minimum	Mean	No.	Maximum	Minimum	Mean
60–64	5	120	100	107·6	1	90	90	90·0
65–69	7	125	105	116·1	8	102	90	96·1
70–74	16	130	80	106·2	14	112	85	97·9
75–79	9	120	80	106·7	16	105	85	96·2
80–84	10	135	84	107·3	12	130	75	98·1
85–89	5	115	86	107·2	10	100	85	93·6
90–94	0	...	...	...	2	90	78	84·0
	52	135	80	108·058	63	130	75	96·0

When these figures are translated into grams per 100 ml., it will be seen that the mean for men is 18.3 gms. and for women 16·6 gms. The maximum for men is 23·3 gms., for women 22·3 gms. The minimum is 13·8 gms. for the men and 12·9 gms. for women. The standard errors of the means for men are ±1.55 and for women ±1·12.

The second series from Tooting Bec, gave somewhat lower levels. The mean, 103·3 per cent. was equivalent to 14·25 gms. per 100 ml. The maximum figure was 17·6 gms. and the minimum 11·1 gms., with a standard error of the mean = ±1·2. For a comparison of the range in the two series see page 347.

It will be seen from Table 2 that there is little, if any, relation between age and level of haemoglobin with either men or women. This is brought out by Figures 5 and 6, in which the spots on the diagram are scattered quite haphazardly. This impression is confirmed by the correlation coefficients. For men, the correlation between age and haemoglobin is—0·2016 with the standard error ±0·133, which is not significant. For women the figures are —0·1543 and ±0·123, again not significant. Such correlation might easily arise from chance distribution.

COMPARISON OF SERIES 1 AND 2

It will be noticed that there is quite a difference between the means or averages of the patients at St. John's Hospital and those at Tooting Bec. The difference is, in fact, more than twice the standard error and therefore significant. It should be remembered, however, that the cases in Series 1 were patients in hospital, originally admitted for treatment of some disease, and later transferred to St. John's as incurable in body or mind. Those in Series 2 were more or less healthy senile dements. It will be noticed that seven men in the first group had haemog-

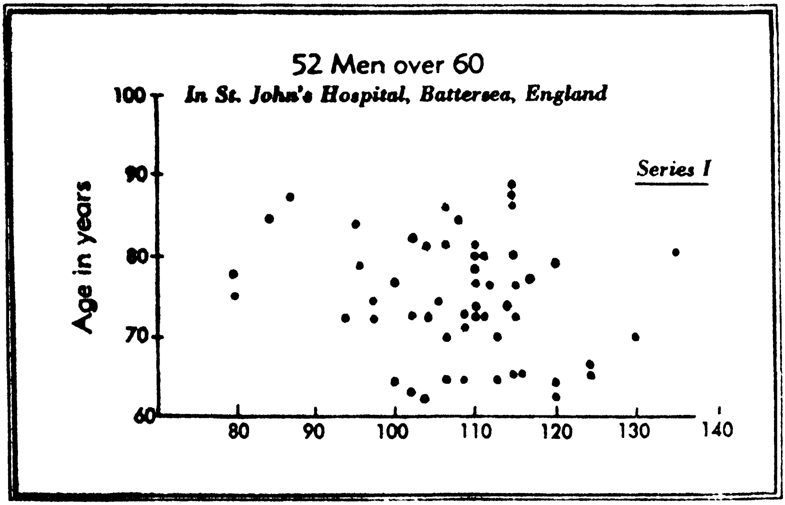

Fig. 5 — Haemoglobin per cent.

lobins above 120 per cent., which would have been excluded from Olbrich's series as abnormal. Similarly, six men in the second group would have been excluded by Olbrich. It must be remembered that in old age the variations in all functions are much greater than in earlier life. For this reason the exclusion of such high results is unjustified.

When we come to compare the figures from Series 1 and 2 with those of Olbrich, or all three with those of the Medical Research Council, one or two interesting points emerge.

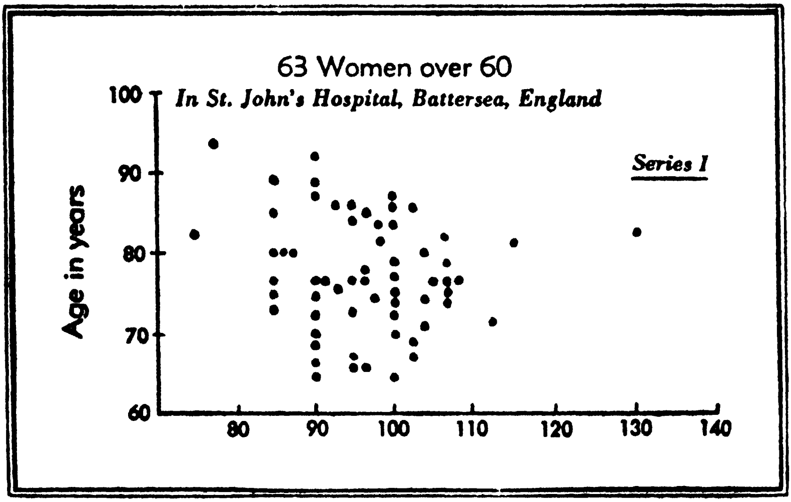

Fig. 6. — Haemoglobin per cent.

For instance, the difference of 2·6 between the men at Tooting Bec and those examined by Olbrich has a standard error of difference 1·84, which is not significant. When we compare the patients from St. John's, the difference is 7·4 and the standard error 2·09, which is significant. Similarly, the difference of both Series 1 and 2 from the Medical Research Council committee's figures are significant, while the figures of Olbrich are not so. When these results are compared with the Medical Research Council figures for men under 60, the figures from St. John's show a significant rise, while the others are not significant in difference. As regards women, however, the differences are not significant. These results are set out graphically in Figures 7 and 8.

INTERPRETATION

The first fact to emerge from this mass of figures is that old people are not anaemic. Neither the apparently healthy old folk from Queensberry House, examined by Olbrich, nor the senile dementa from Tooting Bec, nor the chronic sick at St. John's showed diminution in the amount of haemoglobin, judged by normal standards. The second idea to gain support is the rise of haemoglobin after the menopause in women. Even so, the level never reaches that of men in any of the series here reviewed.

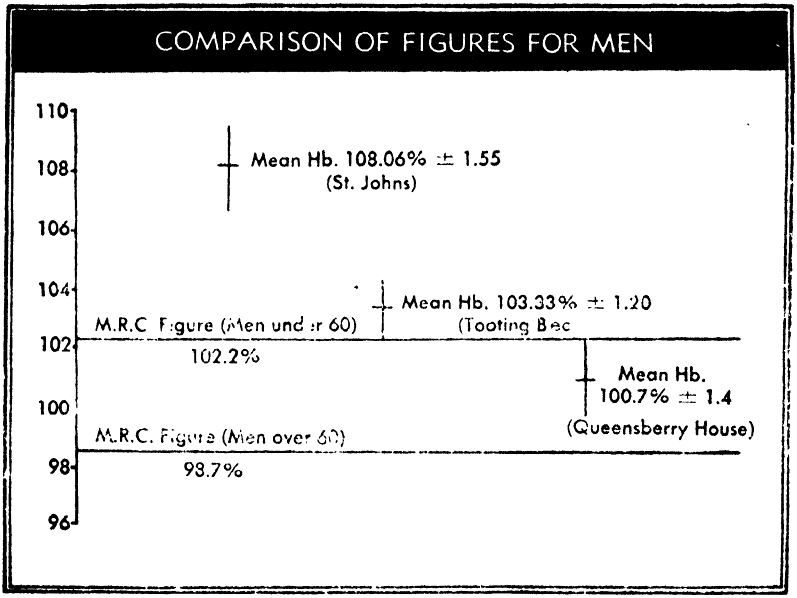

Fig. 7. — Haemoglobin per cent.

When we come to consider the range of readings encountered, we find that this follows the true "senile" pattern in that it is much wider than normal. In this case, the extension is in the direction of a greater hemoglobin content rather than less, as has been expected in the past. The range also appears to be less in women than in men.

It is strange that the highest mean figures were found in the male patients of a chronic hospital, while the male senile dements also had a percentage above the normal adult level. It suggests

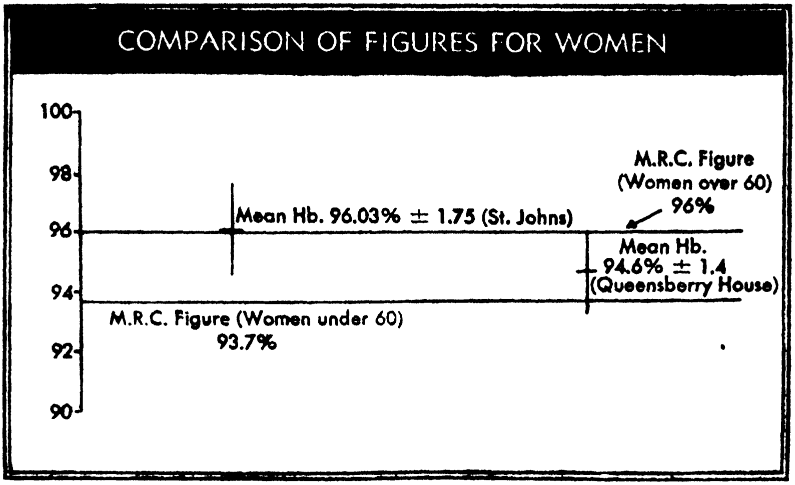

Fig. 8. — Haemoglobin per cent.

that some of the conditions which brought these patients into St. John's Hospital might be associated with the increase. It also suggests that the high haemoglobin levels of senile cases with pulmonary emphysema may need to be considered with a new eye.

SUMMARY

1. The haemoglobin of 53 men over sixty at a chronic hospital showed an average figure of 108·058 per cent. of 18·3 gms./100 ml.
2. The corresponding figure for 63 women of this age was 96·0 per cent. or 16·6 gms./100 ml. Both these were estimated by the Sahli method.
3. Seventy-five male senile dements showed 103·3 per cent. or 14·25 gms./100 ml. estimated by the Haldane method.
4. These figures are compared with the findings of others recorded in the literature.
5. The phrase, "Old people are anemic," appears to be incorrect as a general statement.

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CHAPTER VI

ARTERIAL THICKENING IN OLD AGE

The pathology of arteriosclerosis has been much studied in recent years : but the clinical aspects have had little attention. A small book on diagnosis written by Parkinson in 1898 had more space devoted to examination of the arteries than Saville's " Clinical Medicine " of 1939, which has six times the number of pages. Even Cowdry's symposium on arteriosclerosis does not say much on the clinical aspects of arterial thickening. In fact, Sydenstricker there quotes the statistics of the Life Extension Institute of America, and gives the final age group as " sixty or over ". It is only in this and the following decades that the state of the arteries assumes real importance. It would seem, therefore, that there is a lack of reliable information about the arterial thickening of later life, at least on the clinical side. Apart from a note by Lansbury and Brown about the importance of calcification and the figures of Sydenstricker, there is little in recent papers which bears on this point. The present paper deals with the findings on examination of Chelsea pensioners and offers a new method of classifying arterial thickening in old persons.

STANDARDS

This investigation was one of a series designed to provide data about the normal variations of temperature, pulse rate, blood pressure, arterial thickening, etc., in healthy old persons. Chelsea pensioners, of whom 341 were examined, proved excellent material for this purpose. All were veterans of the old professional British regular army and therefore had been fit, healthy men accustomed to exertion in their early manhood. Before coming to the Royal Hospital, they had to be medically certified as being fit to perform light duties—sick men not being admitted. In addition to being selected material, these men lived a regular life under supervision and medical observation.

Every man in the series under review was given a physical examination, in the course of which his radial, brachial, temporal, and femoral arteries on both side of the body were palpated.

The vessels were compressed by the index and ring fingers while the third finger felt the artery and rolled it under the finger-tip. After this, the fingers were rubbed up and down the course of the vessel longitudinally to ascertain the amount of tortuousity or calcification present, as well as the amount of thickening of the wall.

Generally speaking, the brachial arteries, showed thickening of their walls more markedly than any others, but calcification was found only in the radial and temporal arteries. Tortuousity was common in the temporal vessels, but also occurred in radials and brachials. In the last two it was associated with at least moderate thickening, which was not the case as regards the temporals. The brachial tortuousity took the form of small segments of a large curve, but the radial curves were often large segments of a small one. Brachial tortuousity was often accompanied by radial calcification. In fact, one group (IV) in the suggested classification was composed of cases showing brachial thickening and tortuousity with slight or patchy calcification of both radials. Examination of the femoral artery gave little additional information as a rule. The fundus oculi was not examined, a previous survey having shown little correlation between the opthalmoscopic picture and the peripheral general arterial state. (Howell, *Brit. Heart J.*, 1942). For classification purposes, the final impression after examining and, if necessary, re-examining the accessible arteries was taken as guide. A few cases were hard to decide, but these mostly had some calcification of one radial with only slight thickening elsewhere. The classification of arterial changes by age groups is shown in Table 8.

TABLE 8—*Arterial Thickening in Patients divided according to Age*

Age period	Group distribution of each age period in percentages of each age period					
	Total	No. I	No. II	No. III	No. IV	No. V
55–59	3	100	—	—	—	—
60–64	11	27	54	19	—	—
65–69	37	27	19	43	8	3
70–74	146	19	21	48	8	4
75–79	81	8	13	57	15	7
80–84	40	5	10	43	30	12
85–89	20	—	10	40	25	25
90–95	3	—	—	—	—	100
	341					

CLASSIFICATION

Five groups of men were found on analysis of the 341 examined. The first consisted of those without any obvious arterial thickening. The second was composed of those in whom the thickening was slight. The third group, classified as having moderate thickening, had arteries that were easily palpable. The fourth showed thickening of all the arteries examined, with tortuousity in some of them, often accompanied by slight or patchy calcification of the radials. The fifth group had marked calcification present. As may be seen in Table 8, there tended to be a steady drift from group I to group V as the age increased. One man, not included in the series, was watched over a period of five years. At the beginning of this time, although his fundus oculi showed arterial changes, there was only minimal thickening of his limb vessels. At the end of the period, he was in group III. Other men observed over a period of three years, passed from group II to group III, from III to IV, from IV to V, and even from III to V during this time. This occurred in ten patients, while ten others remained in the same state as at the beginning of the period. No cases were found to proceed from harder to softer arteries, or from tortuousity to straight vessels, but two doubtful cases were finally settled in group IV, rather than group V.

The first group, those without arterial thickening, was composed of 53 men (Table 9), whose ages ranged from fifty-six to eighty-four. Many of the older members did not look their age nor behave in a senile fashion. A few were obese, so that palpation of their vessels was not easy. The vast majority in this group were fit and healthy, only two having physical signs of disease; one had a Plummer-Vinson syndrome, the other had high blood pressure with auricular fibrillation and a large heart.

TABLE 9

Age of Patients divided according to Group of Arterial Thickening

Arterial group	Percentage of each arterial group in each age period				Total	Percentage
	55–65	65–75	75–85	85–95		
I ...	12	71	17	—	53	15·5
II ...	10	65	22	3	60	17·8
III ...	1	54	39	5	159	46·2
IV ...	—	34	54	12	44	12·9
V ...	—	24	44	32	25	7·6
					341	100·0

The second group of pensioners comprised 60 men between age sixty and eighty-five. In these cases the arteries could be felt like a thin tape when the vessels were compressed. Any with vessels more prominent than this on palpation were placed in the next group, if more than one artery was affected. The brachials were easier to feel than the radials, while the temporals often had tortuousity, but nevertheless remained soft. The age distribution was similar to that of the preceding class, except that a larger number of men over seventy-five was met. Only three of the men had a medical history of any significance, two having past cerebral thromboses and one congestive heart failure following hypertension.

The third group was by far the largest. It contained the men with arteries that were thickened, but not tortuous nor calcified. The degree of thickening varied from a sensation as of a soft cord under the skin to that of a tough leathery tube. There were probably several sub-groups not yet clearly defined. The number of cases totalled 159, nearly half the number of men examined. Over 40 per cent. of all men between sixty-five and eighty-nine came into this class, but only two were under sixty-five. A great variety of physical states was met in this category of pensioner, varying from perfectly fit healthy old men to those with chronic bronchitis, with old hemiplegia, or with cerebral arteriosclerosis. The younger members of the group were not more clearly healthy nor more conspicuously unfit than their seniors. For this reason it is hard to draw any conclusions about the significance of this degree of arterial change.

The fourth group was composed of 44 pensioners whose ages varied from sixty-six to eighty-nine. More than half the men were over eighty. As the distinguishing feature of the group was the possession of arteries that were thickened and tortuous, with or without slight calcification: it suggests that extreme age, tortuousity, and calcification are connected in some way. The calcification varied from a few hard beads to be felt on rubbing up and down the vessel to irregular hardened areas several millimetres in length. Ten men (23 per cent.) in the group were noted as completely fit. The others had signs of past disease or of degeneration such as sclerotic cardiac murmurs, marked effort dyspnœa, hemiplegia, and so on. Some of the pensioners who needed recurrent admissions to the infirmary of the hospital were found here. On the whole, the older men were healthier than the younger ones with this group.

The fifth group included 25 pensioners all of whom showed marked calcification of their radial arteries as well as thickening of their palpable arteries. Their ages ranged from sixty-six to ninety-one, three quarters of them being over seventy-five. All three men over ninety were in this group ; but the oldest pensioner in the hospital, aged ninety-six, who was not included in this series, would have been placed in the fourth group. Twelve of the men were relatively healthy and able to get about in comfort. The remainder were more or less infirm, six having only recently returned from the infirmary to which they had been on account of advanced cardio-vascular disease requiring treatment.

BLOOD PRESSURE

Each man had a blood pressure reading taken as part of his examination. While a single reading is not satisfactory, it was noted that, in cases where the usual figures for a man were known, there was no deviation from what had been expected. 79 per cent. of the pensioners had systolic readings over 160 mm. This was higher than the 50 per cent. with similar levels found in 120 successive admissions to the infirmary in 1941-42. The present series, however, deals with the healthy men and not the sick. It was found that in group I, 59 per cent. had a systolic pressure over 160 mm.; in group II, 53 per cent.; in group III it rose to 80 per cent.; in group IV to 84 per cent.; and in group V to 96 per cent. The high precentage in the last three groups is noteworthy. About a quarter (24·6 per cent.) of the men had

TABLE 10—*Systolic Figures over 200 mm.*

Arterial group	Age periods				Total	Percentage of of each group with B.P. over 200
	55–65	65–75	75–85	85–95		
I ...	0	5	1	0	6	11
II ...	0	2	4	1	7	12
III ...	1	24	15	4	44	29
IV ...	0	5	9	2	16	37
V ...	0	3	6	4	13	52
All groups	1	39	35	11	86	25
Percentage of each age period with B.P. over 200	7	21	29	50	25	

their systolic pressure over 200 mm. In these pensioners, the diastolic figures varied from 100 mm. to 140 mm., only a small number being over 120 mm. Out of a total of 86 patients, 6 were in group I, 7 in group II, 44 in group III, 16 in group IV and 13 in group V. Only 1 was under sixty-five, 39 were between sixty-five and seventy-five, 35 between seventy-five and eighty-five and 11 between eighty-five and ninety-five. These results are shown in Table 10.

As may be seen from Tables 10 and 11, the percentage of men with a systolic figure over 200 mm., rises with age, but later than the percentage of all the men with raised systolic pressure. From these figures it seems that both advancing age and increasingly thickened arteries were associated with a higher blood pressure.

TABLE 11—*Arteriosclerosis and Raised Blood Pressure*(*over* 160 *mm.*)

Arterial group	Age periods				Total	Percentage of each group with B.P. over 160
	55–65	65–75	75–85	85–95		
I ...	1	23	7	0	31	59
II ...	2	19	11	2	34	53
III ...	1	64	54	8	127	80
IV ...	0	13	20	4	37	84
V ...	0	6	10	8	24	96
All groups ...	4	125	102	22	253	77
Percentage of each age group	28	68	84	95	77	

DISCUSSION

The first impression arising from the examination of these cases was that the usual procedure of compressing the radial artery at the wrist was not a sufficient guide to the state of the vessels. In some patients there would be neither tortuousity nor calcification in the segment of the artery palpated, and this might give rise to a false estimate of the degree of arterial change present. Examination of both radials and brachials was the minimum which could be of any real value. Also the process of rubbing the fingers up and down the course of the artery gave a lot of information about its condition that was not elicited in any other way. This was especially true when the patient was obese and the vessels not easy to feel. Next, it was found that while there was truth in the general rule that thickening, tortuousity, and calcification grew more frequent with advancing years, yet many exceptions could be met. In fact, there seemed to be a number of men in the eighties whose arteries would not have been abnormal for those twenty years their junior. The group III cases were a real problem. While the proportion of pensioners with raised blood pressure was much higher than in the two preceding groups, and a history of past vascular lesions was not uncommon, yet a number of the men in this group were known to be much more active in body and mind than others of their age. Even among those between sixty and seventy there were about equal numbers of prematurely decrepit veterans and men who were taken for fifteen years less than their true age. The sensation of moderate thickening of an artery covers so many gradations which it is difficult to distinguish that, as stated before, there are probably several sub-groups. As expected, tortuousity and calcification were usual in pensioners over eighty. The ability to express these findings in a simple classification indicates that it has some advantages over the "slight," "moderate," "marked" thickening and "calcified arteries" which are the terms commonly employed at present.

SUMMARY

When the arteries of 341 Chelsea pensioners were examined, it was found that they could be classified into five groups, each with distinct characters; and probably successive stages of sclerotic change. An improved method of clinical examination of arteries is described and its advantages pointed out.

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CHAPTER VII

SENILE DETERIORATION OF THE CENTRAL NERVOUS SYSTEM

A CLINICAL STUDY

Comparatively little has been written about the clinical aspects of neurology in the aged. Even textbooks dealing with old age, such as those of Thewlis (1946) and Stieglitz (1943), are unsatisfactory. The best account at present is that of Macdonald Critchley (1931). He notes the frequent occurrence of several clinical changes. Diminution of objective pain sensation is mentioned, while complaints of subjective pains are said to be common. Progressive loss of vibration sense is stated to be customary, while sluggish pupils, missing superficial reflexes, and weak or absent tendon-jerks are said to be the usual findings. No indication is given, however, of the frequency of these signs or of the age at which they may be expected.

Since the absence of reflexes and alterations of sensation might give rise to the misdiagnosis of neurological lesions, it seemed expedient to examine a series of healthy old people to ascertain what variations are normal. I therefore examined 200 Chelsea pensioners. Most of these men were known to me both personally and professionally, so that considerably more co-operation was forthcoming than might otherwise have been the case. This should add to the credibility of the clinical findings. Among the pensioners examined a small number were found to have neurological lesions previously unrecognized : these were omitted from the series. The results of the clinical examination of the nervous system are described below.

MOTOR CHANGES

Tendon Reflexes.—Each case was tested for supinator, triceps, biceps, knee, and ankle jerks. Only 7% of those examined had every reflex present, these being in the younger age groups. The arm-jerks were normal in all men under 70, but the ankle-jerks were not elicited in over half the cases even at this age. In those over 70 there was a definite drop in frequency of all reflexes, but no further decrease until the age of 85 except in the ankle-jerks (Table 12).

TABLE 12.—*Percentage of Tendon Reflexes Obtained*

Age	No.	Supinator		Biceps		Triceps		Knee		Ankle	
		R.	L.	R.	L.	R.	L.	R.	L.	R.	L.
65–69 ...	16	100	100	100	100	100	100	87	87	43	38
70–74 ...	57	67	65	88	88	70	72	79	77	32	35
75–79 ...	72	69	68	84	85	84	84	76	76	32	35
80–84 ...	31	68	65	90	90	87	80	80	80	12	12
85–91 ...	9	33	33	66	66	44	55	44	44	22	22
Mean values ...		69	63	86	87	79	79	77	77	29	31

Superficial Reflexes.—Contrary to expectation, the vast majority of plantar responses were normal. Age did not seem to have any bearing on the frequency of abnormality, which was 5%, mainly scattered in the age groups between 70 and 84. There was no difference between the two sides of the body, except in three pensioners. The abdominals, however, were elicited less regularly. The upper quadrants always responded more easily than the lower ones, but there was no constant difference between right and left sides of the belly. The average for all the men was less than 50%, with a drop at 70 years of age and another drop after 85, similar to that found in the deep reflexes (see Table 13).

TABLE 13.—*Superficial Reflexes*

Age	No.	Abdominals		Plantars	
		R.	L.	R.	L.
65–69	16	100% 63%	100% 75%	100%	95%
70–74	57	54% 51%	49% 52%	96%	94%
75–79	72	47% 36%	45% 40%	96%	96%
80–84	31	61% 42%	48% 35%	89%	87%
85–91	9	22% 0%	22% 0%	100%	100%

Power.—Power was assessed only roughly in the absence of a dynamometer. The pensioners were graded by strength of grip and by power of flexion and extension at elbow and knee. The results were classified as very good, good, fair and poor. Loss of strength seemed to develop with increase of age, but this was not universally true in the cases examined, as may be seen in Table 14.

TABLE 14.—*Power in Limbs*

Age	No.	Very Good	Good	Fair	Poor
65–69	15	40%	33%	27%	0%
70–74	54	13%	62%	20%	5%
75–79	66	8%	39%	45%	8%
80–84	31	16%	29%	32%	23%
85–91	8	0%	37%	50%	13%
	Means :	13%	44%	34%	9%

SENSORY CHANGES

Vibration Sense.—As changes in vibration sense were among the positive findings noted by earlier observers considerable care was taken in testing for this form of sensation. Bony points on both wrists, elbows, shoulders, ankles, knees, shins, and the sacrum were tested. The percentage registering on the sacrum was uniformly small in every age group. More than 90% appreciated vibration on the bones of the upper extremity. Ankles and shins showed perception in over 70% of cases, but the knees appreciated the sensation in just over 50%. The results are shown in Table 15.

TABLE 15.—*Percentage Registering Vibration Sense*

Age	No.	Wrists		Elbows		Shldrs.		Ankles		Shins		Knees		Sacrum
		R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	R.	L.	
65–69	16	100	100	100	100	80	94	87	87	94	87	50	56	12
70–74	57	100	100	100	100	98	98	88	84	81	79	61	67	18
75–79	72	100	100	100	100	90	89	76	73	73	74	51	53	15
80–84	32	97	97	94	97	94	94	62	56	62	44	31	34	10
85–91	9	100	100	100	100	100	100	89	89	67	78	67	78	11
Mean :		99	99	98	99	94	94	79	76	75	72	52	56	15

Joint Sense of Position.—The sense of position of joints was tested by moving the great toe on each side. Three tests were made for each toe after a period of irregular movement. The vast majority of patients showed normal position sense in the feet (Table 16).

TABLE 16.—*Position Sense of Toes*

Age	No.	Abnormal Right	Abnormal Left
65—69	16	0%	0.5%
70—74	56	4%	3%
75—79	72	2%	3·5%
80—84	33	1%	1%
85—91	9	0%	0%

Nose-Touching.—To my surprise quite a number of the pensioners were unable to touch their noses accurately when their eyes were closed. The resulting movement was not an intention tremor but a definite dysmetria. This was usually present in both hands, but if one alone was involved the left was the site of occurrence more often than the right. Up to the age of 85, increasing years had no effect on the frequency of the abnormal findings (Table 17).

TABLE 17.—*Dysmetria in Touching Nose*

Age	No.	Right	Left	Both
65—69	16	0%	25%	19%
70—74	56	9%	14%	20%
75—79	72	11%	14%	18%
80—84	33	6%	15%	21%
85—91	9	0%	0%	44%
	Mean :	8%	15%	20%

Rotation of Wrists.—This test showed normal results in four-fifths of the men examined. When there was difficulty in carrying out the movements both wrists were equally at fault. The difficulty appeared to be one of performing an unfamiliar series of muscular exercises and not a cerebellar dysfunction. It is significant that the disability percentage increases steadily with the age of the pensioners tested (Table 18).

TABLE 18.—*Difficulty in Wrist Rotation*

Age	No.	Defective
65—69	16	0%
70—74	56	4%
75—79	72	25%
80—84	33	33%
85—91	9	44%

Pain, Temperature, and Light Touch.—The results of examination for these sensations were often very hard to interpret. Sometimes pain and temperature sense would be diminished over the same area. Sometimes one would be normal while the other seemed impaired. Touch was involved only half as often as the other sensations. Altogether some 45 patients failed to register 73 sensations between them. The findings were most frequent in the age groups between 70 and 85. The sites of anaesthesia were fairly constant. being almost always on either the shin or the forearm. Usually the inner aspects of the limbs were involved, but the distribution seemed to follow more of a cord segmental pattern than to conform to any actual superficial nerve area. As it is not possible to summarize this information satisfactorily in the form of a table, let me state that 24% of the men showed impairment of one kind or another. Two-fifths of these did not register pain, two-fifths did not register changes in temperature, and one-fifth could not appreciate light touch. Deep pain sensation was not tested in this examination.

CRANIAL NERVES

In the examination of the cranial nerves, Nos. 1, 2, and 8 were omitted. The only abnormality detected, apart from changes in the pupils, was an external rectus palsy in two cases. The reactions of the pupils were, however, often abnormal. Sometimes they reacted to light alone, sometimes to accommodation alone, often to neither. A small pupil was more common than a dilated one, but the proportion of either was not great enough to impress the observer.

TABLE 19.—*Percentage of Positive Reactions of the Pupils*

Age	No.	Light		Accommodation		Neither	
		One	Both	One	Both	One	Both
65—69 ...	16	6	69	0	69	6	12
70—74 ...	57	9	60	0	60	9	25
75—79 ...	72	12	54	7	36	10	24
80—84 ...	32	3	50	0	19	3	44
85—91 ...	9	0	33	0	0	0	67
Mean:		9	54	3	41	8	28

It will be seen from Table 19 that if a response is lost it usually disappears in both pupils. Even at the earliest age group nearly one-third of the men had lost either light or accommodation reaction. The percentage of failures to react increases steadily with age, being more complete in the case of accommodation. A completely inactive pupil was found in two-thirds of those over 85.

DISCUSSION

What is the meaning of the findings recorded above ? Let us first try to make a rough statement about the anatomical location of some of the lesions which are indicated. This is not easy, for they appear to be very widely scattered in their distribution.

Judging by the plantar response it would appear that the pyramidal tract is affected in less than 5%, since some of the responses considered abnormal were not of true Babinski type. The frequent absence of the tendon reflexes would suggest possible cord lesions, at varying levels. With regard to the sensory losses, it would seem that sensations passing in the lateral spinothalamic tract are lost twice as often as those conducted by the ventral one. A discrepancy appears, however, when the various posterior column sensations are examined. Position sense is normal in the feet of nearly all those examined. Yet vibration is often not felt in the sacrum, ankles and knees. Dysmetria in the arms is not uncommon. It seems hard to reconcile such findings anatomically. In the same way, the variations in response of the pupils to light and accommodation, tending to become more frequent with advancing years, suggest a progressive but patchy dissolution. It is possible, of course, that some of these lesions, may be functional and not organic. For example, it has been shown that the incontinent bladder of old age can be brought under conscious cerebral control by suitable treatment in a number of cases.

The most important result of the investigation, however, is the wide variation of " normal " findings in old age. Until this is appreciated, non-existent disease of the central nervous system will frequently be suspected or even diagnosed. I have often seen clinical combinations suggesting tabes dorsalis or progressive muscular atrophy in pensioners who were really healthy. Doubtless others have had a similar experience.

SUMMARY

The results of neurological examination in 200 healthy Chelsea pensioners are given.

Absent pupillary reactions, missing tendon-jerks, and superficial reflexes were common motor findings.

Absent vibration sense in sacrum and lower limbs, dysmetria, and patchy analgesia in the forearms and shins were not unusual.

Anatomical location of lesions accounting for such findings was difficult or impossible.

The possibility of misdiagnosis owing to such results of senile deterioration is stressed.

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CHAPTER VIII

RHEUMATIC DISEASE

Probably the commonest cause of pain in elderly patients living in Great Britain is fibrositis. Yet in the United States, this condition is said to be " so rare . . . that there is much doubt of its existence." On the other hand, an American authority has stated : " Arthritis is universal in old age. So also is the fear of it." But, during the war, a rheumatic clinic for the pensioners of the Royal Hospital, Chelsea, was only treating 12 cases of arthritis among 500 old men. The bulk of its work was made up of patients with fibrositis and various minor strains or injuries. Strangely enough, Charcot, in his celebrated lectures on senile and chronic diseases, says little or nothing about rheumatic disease of soft tissues while giving a classic account of arthritis. Among the out-patients of the Geriatric Unit at St. John's Hospital, Battersea, the rheumatic cases fall into three groups. The largest of these are old folk with fibrositis or muscle spasm ; next come those, mostly women, with late stages of rheumatoid arthritis ; finally, there are those with osteoarthritis. By reason of selection, the in-patients are mainly cases of rheumatoid arthritis in their later stages. These elderly people produce problems in diagnosis and treatment which are peculiar to their time of life. These differ in some ways from those of younger folk and will therefore be discussed below.

FIBROSITIS

The outstanding characteristic of fibrositis in old people is its tendency to recurrence. There are some patients who find it coming back to the same spot a few weeks after a course of treatment has apparently cured the condition. Another group of cases seem never to be without a patch of fibrositis in some part of their body. As soon as one area is free from pain, another starts. Many patients in the first category come to the physician with the label of " arthritis ". When examined carefully, however, the pain is not in the joint, but in the soft tissues around it. There may or may not be evidence of arthritis on the X-ray film, but the actual pain is often due to fibrositis or muscle spasm. Infiltration of the tender spots with local anæsthetic removes the pain and allows free movement of the joints.This finding is commoner in cases of osteoarthritis, especially when the hip or elbow is affected. But it is not rare in those who have a rheumatoid picture. Concentration on local treatment, as opposed to general measures, often restores a degree of mobility which surprises everybody.

Mr. W., aet. 72, originally attended the out-patient department wheeled in a bathchair. His X-ray showed considerable osteoarthritis of the right hip and both knees. Only the hip was painful, however. The tensor fasciæ femoris was tender and felt corrugated under the examining finger. After eight injections of procaine, combined with radiant heat, deep massage and exercises, this patient was able to walk without pain. Judged by X-ray, the condition of his joints was unaltered. Yet his mobility and outlook on life were quite different.

In some ways the pattern of tender spots in the soft tissues of the elderly is not the same as that in the young. While the upper edge of the trapezius muscle remains the commonest site of fibrositis, tender areas lower in the back are less frequent. Sometimes there is lumbar or gluteal tenderness, but this does not seem so common as among middle-aged patients. Painful spots in the insertion of the quadriceps femoris account for a high proportion of complaints in the region of the knee joint, the inner aspect being involved more often than the outer side. The deltoid insertion is another favourite point, while around the elbow, the tissues in front of the coronoid process of the ulna may be affected. A few patients show massive involvement of the pectoralis major, which can simulate carcinoma of the breast.

When treatment is considered, old folk respond much more slowly than young ones. There are few who are relieved by one or two injections of local anæsthetic and nothing else. Heat and deep massage sometimes give temporary relief, but leave the patient attending the physiotherapy department for months on end. In the experience of the writer, a combination of the two methods is more effective. Even so, a number of cases seem to be resistant. Some of these have been treated by injections of A.B.A. or proctocaine. The effect has been disappointing. Relief from pain has only lasted about two days, which is the same period as obtained with procaine alone. Since the eradication of septic foci cannot be pursued among the aged with the same zeal as in the young, this line of attack is not helpful. Search for skeletal abnormalities is apt to be either unrewarding or confusing in old folk. We do not know enough of the normal variations, especially in the spine, to decide when muscular pains have an osseous origin. This has been true ever since Inman started the idea of " spinal irritation as a cause of myalgia " in 1856. The practice of giving liniments or ointments for the patient to rub in is usually unsatisfactory.

An exception must be made, however, when the drugs adrenalin (Moss) ephedrine and belladonna are considered. When any of these are employed in a vanishing cream base and rubbed deeply in to the trigger point causing muscular pain, there is, first of all a softening of the skin which enables nodules, corrugations, or irregularities in the underlying muscles to be felt. A minute or so later, these irregularities tend to soften so that the texture of the muscle becomes soft, smooth and regular. At this stage, the pain begins to disappear. In the case of adrenalin cream, relief may be experienced within a few seconds and last up to 12 hours. With ephedrine, relief may take several minutes to begin, but may last as long as five days. The action of belladonna appears to be intermediate between these two. The composition of the base in which these drugs are employed is of the utmost importance. Ordinary cold cream is slow and uncertain in its action ; pure vanishing cream disappears too quickly to allow complete absorption. The most satisfactory preparation is that worked out by Miss Will, Pharmacist of St. John's Hospital :

Emulsifying Wax	20 parts.
Adeps lanae	10 parts.
Chlorocresol	0.05 parts.
Water to	100 parts.

Doses usually employed are Adrenalin 1/5000
ephedrine 1%
belladonna 20% of the liquid extract.

In the clinic for Rheumatic Diseases, in elderly patients, the use of these drugs by inunction has largely superceded the previous practice of injection with local anesthetics. Not every case responds, and unless patients are shown how the cream should be rubbed in to the trigger point so that it is all absorbed, full benefit is not obtained ; yet it does seem to be a definite advance in the treatment of long-standing fibrositis. Other measure to promote relief of pain are the use of tablets Codeine Co., a mixture containing Phenazone and a combination containing barbiturates is often helpful : such tablets as allonal (Roche), somnased (Duncan Flockhart) or amytal and aspirin (Lilly) are worth trying. A few cases benefit from iodides, especially where there is early osteoarthritis of the knee ; many, however, do not.

RHEUMATOID ARTHRITIS

By the time that old age is reached, the active or acute phase of rheumatoid arthritis has usually subsided. We are left with the tangled wreckage of limbs and joints produced by the disease. These can be divided into three classes. First, stiff or ankylosed joints ; second, mobile deformities ; third, contractures. The first of these can be treated by intra-articular injection of procaine lactic acid and manipulation in a number of cases. It may be necessary to continue injections for weeks or months before any great improvement shows itself in certain patients. Others have joints which become mobile almost immediately. The effect of the injections is greatly enhanced if physiotherapy, remedial exercises and occupational therapy are employed in addition. Yet it is possible to treat chronic rheumatoid arthritis successfully by injection and manipulation alone.

Clara B. was in a ward of a chronic hospital which was not visited by the physiotherapist. She had been bedridden for 12 years. After six injections of P.L.A. into her hips and knees, she was able to get a fair amount of movement in these joints. Later she was transferred to a more active section of the hospital in which physiotherapy and rehabilitation was in progress. The additional treatment did not increase her rate of progress materially, however. At times, physiotherapy was suspended owing to staff difficulties, while injections were continued. Some of her greatest increases of joint movement took place in periods such as these.

When treating mobile deformities, it is important to remember that function is more important than appearance. A hand with a grip is useful whatever its unsightliness.

Mr. S., aet. 72, had a flexion deformity of his right hand with ulnar deviation of the fingers. The left hand was so bent at the wrist that it formed an angle of 90 deg. and was fixed in that position. The fingers were hyperextended and could not bend. Two phalanges were dislocated and the heads of the metacarpals displaced downwards. After a year of P.L.A. injections into the wrist and fingers, the wrist was manipulated under an anæsthetic. This was followed by serial plasters to correct the position. Later, the head of one metacarpal bone was removed. Mr. S. can now use this hand, feed himself with it and hold a pipe in it. The grip is quite strong. It still has some residual deformity, but is now functionally effective.

In the treatment of these conditions, occupational therapy plays an important part. Knotting wool to make rugs, using various kinds of loom, basket work and leather work all tend to increase functional capacity. If there is stiffness of small joints, a course of paraffin wax baths, repeated at intervals will often make them more supple. When lack of muscular power is present, faradic stimulation can be useful. But active, purposeful movement by the patient is the most valuable of all. Even dislocated shoulders can form new articulations under the clavicle if kept actively employed. The range of movement is less than before, but the new joint is capable of usefulness. The deadly sin is to accept deformity as a cause for diminished treatment. It should be signal for added vigour.

The injection of procaine lactic acid into the joints is one of the real advances in the treatment of chronic arthritis. The solution is obtainable from Brady and Martin, of Newcastle-on-Tyne. The affected joints may be injected once a week under aseptic precautions. Up to 10 cc. can be inserted into the cavity of a large joint, such as the knee, and less into smaller ones. If the solution enters the tissues round the joint, it still seems to have some beneficial effect. If air is injected into the joint, no harm is done. Some minutes after injection, the joint should be put through its full range of movements. It has been the experience of the writer that, as the course of injections proceed, pain is gradually diminished, movement becomes freer and sometimes crepitus grows less. Both rheumatoid and osteoarthritis benefit, but the most striking results have been seen in the former type.

The best account of this form of treatment has been given by Mawson. A few practical notes may be of interest, however, The sites for injection differ a little from patient to patient. In the knee, the best point seems to be half to one inch lateral to the lower part of the patella, just above the tibia. The wrist may be approached dorsally between the tendons of extensor pollicis longus and extensor indicis. Laterally, a suitable point is distal to the tip of the ulnar styloid process. Medially, the anatomical snuff box can be used. The elbow is best entered from the antero-external aspect, just above the head of the radius, or posteriorly. The shoulder may be injected from in front, a little below the clavicle. The hip requires a needle six inches long, which is inserted just behind the great trochanter in an upward, inward and forward direction. Since the capsule of many arthritic joints is very much thickened, difficulty in injecting the fluid usually means that the joint cavity has not been reached. If the needle penetrates bone or cartilage, pain of a sickening character results. Apprehensive or sensitive patients are best given a sedative, such as allonal, an hour before the injection. Afterwards there is some soreness for twenty-four hours, usually controlled by aspirin or Tab. Codeine Co. If the manipulation is unusually forceful, pain may last for two or three days.

In cases where the patient is thin, feeble and apparently undernourished the use of Benecol tablets (Benger) two or three, three times a day in conjunction with a high protein diet is often worth trying. In a small series of cases at St. John's Hospital the administration of Benecol in this way produced an increase of weight and an improvement in the morale and well-being of the patients.

When contractures are present, however, the position is much more serious. A contracture seems to pass through two stages before becoming finally fixed. The first sign is increased tone of one or more flexor muscles. In the arm these are usually the biceps and the brachio-radialis. In the leg, the semi-membranosis and the semi-tendinosis, less often the biceps cruris. On extension of the elbow or knee, these muscles can be seen to stand out and form an arc across the angle of the joint. At the same time there is a loss of tone in the opposed extensor muscles. Later the increased tone in the flexors becomes greater so that the length of the muscle is definitely less than normal. Eventually, fibrotic changes make their appearance to give a fixed deformity. Anatomically, the contractures of arthritis do not differ from those of a hemiplegic patient. Whether they differ physiologically remains to be seen. Up to date, the writer's attempts at treatment of contractures have not been successful. Serial plasters, each straightening the limb more than the last, were first tried. When the final plaster was removed, however, the limb returned to its former flexed position. No gain in functional efficiency was noticed. Manipulation under an anæsthetic gave no added range of movement, but merely transferred the arc of motion, so that flexion of the joint was more difficult, while extension was a trifle easier. In practice, this meant that one patient could no longer use the left hand to do her hair or wash her face. More recently various drugs have been tested for their effect on contracted muscles. Atropine, hyoscine, quinine, prostigmine, myanesin and tubarine have been thus employed, singly and in varying combinations. So far, no striking improvements have been obtained when checked by goniometer measurement. All give a few degrees of movement more than the original base line. The effect of myanesin and tubarine lasts only for a short while when given intramuscularly. Myanesin by mouth has also been tried without great effect.

If joints which are the seat of contracture are examined under X-ray, the bones are often extremely de-calcified. When forcible extension is attempted, a small amount of joint movement can be obtained in some cases. In others, the joint does not move. If these are forced further, the shaft of the bones can be seen to bend under the tremendous pull of the contracted muscles, in certain cases. This phenomenon is being investigated further, as it seems to alter our present notions of the physiology of bone in relation to muscle attachment. It is obvious that the nature and origin of contractures need a great deal of study in the future. They form the worst stumbling block to success in treating chronic rheumatoid arthritis.

Even in elderly patients there may be exacerbations of rheumatoid arthritis. It has been found that the pain, swelling and limitation of movement in such cases can be relieved by an intramuscular injection of T.E.A.B. (tetra-ethyl-ammonium-bromide).

This has been used on sixty occasions within the last six months, and there have only been three failures. The pain is relieved within a few minutes so that the joint can be moved without distress, and a patient brought in a wheel chair, unable to stand because of pain in the knee, can be enabled to walk home again. It must be emphasised, however, that this drug only benefits pain arising inside the joint and sometimes makes " soft-tissue " extra-articular pain worse (but this latter distress can be treated with adrenalin or ephedrine cream). In patients whose blood pressure is low, the vaso-dilator action of the drug may cause syncope or collapse in the usual doses of 5 c.c. of a 10 per cent. solution. Smaller amounts must, therefore, be used in such cases. This ability to relieve pain in an acute "flare-up" of the joint condition may only persist for two days, but often the pain will not return for several weeks or months. It is thought, therefore, that this drug will be a very useful weapon in the treatment of this complicated disease.

OSTEOARTHRITIS

Most elderly people have some degree of osteoarthritis. In many cases it is painless. In others, the associated pain is due to fibrositis or spasm of the overlying muscles, as seen above. Treatment by intra-articular injection of procaine lactic acid as advocated by Waugh and others has greatly improved the outlook in this disease. There are patients, however, who develop loose bodies in their joints which render successful treatment difficult. Some of these may be subjected to operations for removal of these bodies, only to have another develop later. In such patients, the final answer must eventually be arthrodesis. A painless, stiff leg is better than a painful mobile one. The only alternative is amputation and fitting an artificial limb. Where one knee alone is badly damaged this course may be worth considering at times. But it should be remembered that many old people never get accustomed to an appliance of any kind. A careful assessment of the mental adaptability of the patient will be necessary if this procedure is adopted.

Physiotherapy and remedial exercises are less essential to the sufferer from osteoarthritis than to the rheumatoid cripple. Nevertheless they do exert a favourable influence on the comfort of the patient. On the whole, this disease tends to be regarded too hopelessly by the general practitioner. In many cases a relatively small amount of active treatment can bring about a fair degree of improvement. Few subjects need admission to hospital and most can be treated as out-patients if properly supervised. This is the reverse of the situation in elderly rheumatoid patients, where the social angle of medicine is so very important.

It will be seen, therefore, that the outlook of elderly patients with rheumatic diseases is reasonably hopeful if they are treated adequately. They are more complex to diagnose and sometimes more difficult to treat than their juniors. Secondary diseases have a habit of cropping up and demanding attention. Nevertheless, when the physician is prepared to spend time and trouble in looking after his patients, he will often reap an unexpected reward.

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CHAPTER IX

CHRONIC BRONCHITIS

Chronic bronchitis is a common disease about which we do not really know very much. It is chiefly seen in North Western Europe but is rare in North America. It also occurs in India where it often takes the form of dust allergy in Europeans. In 1942 it was responsible for 17,000 deaths among elderly people in this country.

There are three classes of patient who may get chronic bronchitis. First a young group where the disease has an acute onset in childhood and these cases usually die in the thirties. The second class is composed of middle aged men with increasing emphesema who, as a rule, eventually develop heart failure after twenty years of the disease. Finally, we have the elderly patients who do not commence their bronchitis until the 50's or 60's, and who may survive into the 90's before dying of bronchopneumonia or heart failure. Many elderly people have a winter cough which is productive of sputum for a few weeks. As time goes on they cough and spit longer and longer each year until fifty weeks out of the fifty-two find them expectorating. During the winter the amount of sputum is increased ; the cough is troublesome ; and there is usually a considerable amount of wheezing and dyspnœa accentuated on exertion. Yet they can continue in this state for many years.

Bronchitis is in some ways a familial disease and may be handed down from father to son. It is much commoner of course in men than in women and a history on the female side of the family is unusual.

SYMPTOMS

The normal symptoms are cough and dyspnœa, which are accentuated by cold, damp, fog, dust and east winds. Smoking as a rule causes irritability of the pharynx and thus leads to increased cough. A few patients, however, who have a nervous element in their bronchitis, are soothed by a pipe or cigarette and therefore cough less while smoking. Any exertion first causes shortness of breath, then brings on cough and finally leads to wheezing.

SIGNS

The signs of chronic bronchitis are chiefly those of emphysema, with rales and rhonchi in the chest on auscultation. The apex beat of the heart is frequently obscured but there may be increased pulsation in the epigastrium from an over-acting right ventricle. Elderly bronchitic patients tend to have the raised blood pressure and arterial thickening appropriate to their years. During an attack of bronchitis the systolic blood pressure tends to fall, but rises again when the patient has recovered. This phenomenon is most marked when the attack has been a pyrexial one. The rales are best heard at the lung bases behind in the normal case, but may extend all over the chest. Rhonchi and sibili are evidence of bronchial spasm which can be regarded as a complication. They are best heard at the mid-zone in front but are sometimes so loud as to overshadow even the heart sounds. The blood sedimentation rate is normal except in the inflammatory phases of the disease when it usually becomes increased. A persistently raised sedimentation rate usually indicates the presence of a second disease, such as bronchiectasis.

PATHOLOGY

The morbid anatomy of chronic bronchitis essentially consists in inflammation of the mucous membrane of the bronchial tree. The colour may be scarlet, crimson, magenta or purple according to the acuteness of the inflammation and the degree of cyanosis present. The epithelium may be sparse or shaggy and there is a great deal of muco-pus in the tubes. On squeezing the cut surface of the lung little white beads of mucous or muco-pus make their appearance. The right side of the heart is usually enlarged and the ventricle may be dilated. There is often an element of pulmonary congestion. The degree of atheroma present in the aorta is not excessive, while pulmonary atheroma is rarely marked. Other organs such as the liver, spleen and kidneys usually show a degree of congestion. The lungs are emphysematous in almost every case. As a rule, they show the hypertrophic type, but many of the older patients will have the atrophic variety. Histologically, the affected bronchi are denuded of epithelium either partly or completely. Commonly a few cells remain from the deep basal layers after the ciliated cells are detached. This gives the appearance so often interpreted as "columnar epithelium replaced by low cubiodal cells". The basement membrane may be thickened or œdematous. The sub-mucous tissue contains many dilated capillaries and may be invaded by leucocytes. If bronchial spasm has been a clinical feature, the bronchial muscle may be hypertrophied. Where there has been a brisk inflammatory reaction, however, the muscle is often replaced by fibrous tissue. A little deeper the mucous glands are usually enlarged and active, with acini full of clear secretion while the cartilage sometimes shows signs of calcification. Occasionally there is evidence of peri-bronchial fibrosis. The bacteriology of the sputum consists mainly of pneumococci, streptococci, Friedlander's bacillus, micrococcus catarrhalis, staphylococci and other organisms. There is little change from month to month in this flora unless it is affected by treatment with penicillin or sulphonamides, which suppress the sensitive bacteria, leaving Friedlander's bacillus and micrococcus catarrahalis to flourish.

COMPLICATIONS

As we have stated above it is convenient to regard bronchial spasm as a complication of chronic bronchitis rather than as a natural course of the disease. There seem to be three types of origin of this symptom. First there is inflammatory swelling of the mucous membrane, which narrows the passage through which air has to pass. Secondly, there is the allergic muscular spasm, whose mechanism is similar to that found in asthma. Thirdly, bronchial spasm may present itself as a sign of cardiac inefficiency and may then be accompanied with triple rhythm. (It is possible that anatomical proximity of the cardiac and pulmonary plexuses is concerned with this). Another common complication is bronchiectasis with dilation of the tubes following inflammatory weakening of their walls. This is commoner in cases which have frequent pyrexial exacerbations with peribronchial fibrous changes following each attack. Eventually, of course, most cases of chronic bronchitis develop some degree of cardiac insufficiency, the right ventricle being most commonly overloaded. In cases of hypertension, however, sudden left ventricular failure may take place. This sometimes follows a pyrexial bout and often begins at night. As there is an associated dyspnœa with bronchial spasm, the symptoms may be mistaken for an attack of asthma and adrenalin may be given. This of course, is not a satisfactory treatment for the pulmonary œdema which is the basic pathological foundation of the condition. The commonest termination of chronic bronchitis is probably broncho-pneumonia. The signs of consolidation may be difficult to elicit as the temperature and pulse rate are often not increased beyond the normal range in the early stages. Hence, diagnosis tends to be delayed and treatment does not start until the second or third day. This is particularly true of elderly patients and is a reason for the bad prognosis in these cases.

DIFFERENTIAL DIAGNOSIS

The conditions which may be most easily confused with bronchitis are pulmonary tuberculosis, bronchiectasis, carcinoma of the bronchus and low grades of cardiac failure. It is, therefore, necessary in each case to have the sputum examined bacteriologically and to take an X-ray picture of the chest. In bronchitis the radiological signs are chiefly confined to moustache of increased " broncho vascular shadows ", while the parenchyma of the lung remains more or less clear. In the acute stages there may be a little mottling towards the bases but this is never as diffuse as that which characterises pulmonary tuberculosis. In addition, tuberculosis usually has many hard shadows and cavities which are not seen in bronchitis. The presence of tubercle bacilli in the sputum will confirm the diagnosis. To exclude bronchiectasis it is necessary to have a lipiodol bronchogram performed. This will show up dilated bronchi which should not be present in a simple bronchitis. Carcinoma of the bronchus may be excluded on radiological grounds, but bronchosocopy may be necessary in addition. Cardiac failure, on the other hand, may give a negative X-ray and will need differentiation on clinical grounds. The response to mercurial diuretics in a case whose only signs are moist sounds at the lung base will probably be the deciding factor. Rarer conditions such as silicosis, asbestosis and fungus infections will again be diagnosed by examination of the sputum combined with an abnormal radiological picture.

TREATMENT

The question of treatment in chronic bronchitis is rather a difficult one. The main principles are to avoid the causes of bronchial irritation and to delay the onset of complications. Since climate has a great deal to do with the incidence of bronchitis it is advisable for victims of the disease to avoid damp, cold, foggy localities. Irritating dusts and fumes are also to be avoided and special enquiry should be made on this point when the history is taken. The South-west coast resorts are said to be favourable for bronchitis, while the East and North parts of the country are on the whole unsuitable.

When the writer was medical officer at the Royal Hospital, Chelsea, the commonest disease was chronic bronchitis, and a great many cases were treated in the hospital infirmary each winter. During 1941 the sick wards were bombed and a new infirmary was set up near Leighton Buzzard, 40 miles from London. At the onset of winter the regular "bronchitics" were admitted here as a preventative measure. To everybody's surprise these men did not suffer from their customary attack. But on being discharged back to the foggy riverside atmosphere of Chelsea, the disease again manifested itself in the usual way.

Experiments carried out at St. John's Hospital, Battersea, have thrown doubt on the efficiency of many of the normal expectorant drugs. Ammonium carbonate, ammonium chloride, tincture of ipecacuanha, sodium iodide and oil of aniseed seem to have no constant expectorant stimulating action as judged by measurement of sputum over a period of two years. Tincture of opium, camphorated tincture of opium, syrup of codeine and linctus of diamorphine do not regularly diminish the output of sputum when given in customary doses. Under these conditions it is difficult to believe in the efficacy of most traditional cough mixtures. The most effective means of producing increased expectoration is to give a pint of hot water first thing in the morning and last thing at night. Since most patients like a sedative cough mixture at night there is no harm in letting them have either linctus diamorphine or a mixture containing bromide and chlorodyne. The motto " spit by day and sleep by night " is the best one. In the acute exacerbations inhalations of penicillin aerosols are usually effective. A daily dose of 800,000 units, total, divided into five inhalations a day will diminish the amount of sputum, elimanate most of the penicillin sensitive organisms and give symptomatic relief. Physical measures are often beneficial in chronic stages of bronchitis. Every patient suffering from the disease should be given breathing exercises to increase his respiratory efficiency. Many cases benefit from a course of diathermy to the chest. The electrodes should be placed centrally so that the current flows in an anterior-posterior direction. Sideways through and through diathermy is much less effective. In the treatment of bronchial spasm the time honoured mixture of iodide and stramonium is often not effective, and better results are often obtained from ephedrine, grs. ¼ to ½. Some patients complain that this often gives them palpitations or disturbs their rest at night. In these cases aminophylin 4½ grs. usually gives relief. Adrenalin by injection may be necessary in severe cases and is then best administered in the form of long-acting hyperduric adrenalin made by Allen & Hanbury. The action of this lasts from 6 to 12 hours which is especially welcome to ensure a night's rest. Inhalations, such as Brovon (Moore), are welcome to some patients for the relief of spasms, while others prefer some variety of oral adrenalin. When cardiac failure supervenes digitalis is contra-indicated in cor pulmonale. The cardiac output is high and must not be lowered since it is a compensatory phenomenon. The drug of choice, therefore, is ouabaine (Nativelle) in doses of 2·5 mgm, twice to four times daily. Mersalyl must be used with caution as it also tends to reduce cardiac output and to lower venous pressure. When pyrexial exacerbations occur penicillin and sulphonamides should be employed as early as possible.

Delay in exhibiting these drugs will allow consolidation to occur and toxæmia to follow. This is likely to lead to cardiac failure with an ultimately bad prognosis. There is much to be said for nursing cases of chronic bronchitis in an upright position. This allows the lung bases to expand freely and thus permits better æration of the chest. " Chesty " patients in bed tend to slip down flat into an uncomfortable position even when a donkey is provided. Hence it was customary at the Royal Hospital, Chelsea, to nurse cases of this kind in a tall arm chair with good results.

CHAPTER X

THE CARDIOVASCULAR SYSTEM IN OLD AGE

By far the commonest cause of death in elderly people is some form of heart failure. In fact, if we add the cases of cardiac disease to those due to arterial degeneration, it will account for half the total number of deaths in patients over sixty-five years old. Yet medical textbooks have but little to say about the problems of the senile circulation.

Before we consider the pathology of the circulation in old age, however, let us discuss the physiological variants for a brief moment. In a survey of 335 healthy Chelsea Pensioners, whose ages ranged from sixty to ninety-four, several interesting circulatory findings were discovered. First, it was found that about three-quarters of the men examined had systolic pressures over 160 mm. Hg. One quarter showed figures over 200 mm. Pulse pressures were usually high, being as much as 100-120 mm. in certain men. On examination of the arteries, about equal numbers had either no thickening or were only just palpable. These two groups made up a third of the total. Moderate thickening, without tortuosity or calcification, was present in half those examined. The remainder, mostly men over seventy-five, had marked thickening, tortuosity or calcification. Some of the pensioners who had been under observation for several years had passed from softer to harder arteries during this period. On feeling the pulse, arrythmias were very uncommon, but the rate varied from forty-four to 116 per minute in fit, active men. Bradycardia was not unusual.

On auscultation of the heart, murmurs were sometimes heard. Since these pensioners were known *not* to have had rheumatic fever in the past, such murmurs were almost certainly sclerotic in origin. These findings have since been confirmed at post-mortem examination in other cases. Senile bruits are usually due to calcification or thickening of the valves, not to past carditis. Systolic murmurs are three times as common as diastolic ones and apical murmurs are three times as common as basal ones. The latter are almost invariably aortic in position and may be conducted up into the vessels of the neck. I have only once heard a pulmonary systolic bruit in an elderly patient. Basal diastolic murmurs are also uncommon. To reiterate, all these findings were present in healthy, active old men.

When we come to consider the various types of heart disease found in the aged, we find very few cases of congenital origin. Patients with syphilitic cardiac involvement have usually died before the age of sixty, but an occasional aortitis is encountered from time to time. Aortic rheumatic disease is very unusual, but mitral stenosis sometimes allows survival to an advanced age. The oldest cases known to the writer were aged ninety and eighty-nine respectively, and the diagnosis was confirmed at post mortem. Ischæmic heart disease—angina pectoris and coronary thrombosis—is quite common among the elderly. Some degree of coronary atheroma is customary over the age of fifty and may be marked, even at that age. Some Indians suffer from this condition in their forties.

By far the commonest cause of cardiac failure in old age, however, is hypertensive heart disease. In the later stages, when the exhausted myocardium can no longer support its crushing burden, the systolic blood pressure tends to drop. If such patients come under medical attention only at this stage of the disease, they tend to be labelled " myocardial degeneration " by those who are unfamiliar with the natural history of the disorder. Finally, the senile heart seems to be peculiarly susceptible to toxæmia. Cases of acute infections, especially broncho-pneumonia, often die with a failing circulation due to a weakening left ventricle. This is often accompanied by a swollen, tympanitic belly full of inert and distended coils of intestine : a sort of paralytic ileus.

Now the forms and varieties of cardiac failure in old age need special consideration following the recent work on cardiac output and venous pressure. It has been shown that cases with hypertensive, ischæmic and valvular disease go into failure with a low cardiac output, while cases with emphysema or anæmia fail with a high output. Clinically, both types show venous congestion, but digitalis is only beneficial in the low output failures. Some patients with hypertension or coronary disease, however, may present as left heart failure. This often shows itself by paroxysmal nocturnal dyspnœa, which wakes the patient out of sleep in the small hours of the morning, the pathological basis being œdema of the lungs. In certain cases there may be an element of wheezing, so that a misdiagnosis of asthma may be made. Injection of adrenalin makes these cases of left heart failure worse and is contraindicated. In patients who have both chronic bronchitis and high blood pressure, this point is a very important one. Generally speaking, dry lung bases or coarse adventitious sounds favour bronchitis when rhonchi or sibili are heard. Many small moist rales or crepitations at the lung bases suggest a cardiac element especially if the patient is greatly distressed, frightened and fighting for air.

The clinical picture of angina pectoris is well known. Only one diagnostic point needs to be stressed. Cardiac pain occurs characteristically in the mid-line of the chest. Many elderly patients complain of pain around the nipple which is never due to angina, the usual diagnosis being fibrositis of the intercostal muscles. Coronary thrombosis is often less dramatic than in younger patients. It sometimes takes place silently, without the patient's complaining of any pain at all. Often the first sign is a sudden congestive heart failure, conveniently termed "myocardial degeneration" by those who do not or cannot take an electrocardiograph to ascertain the cause.

When discussing the treatment of cardiac failure in the aged, it should be remembered that most old folk recover from their first episode of cardiac defeat, some from their second, but few from their third. A confident prognosis can therefore usually be given for the first attack of congestive failure. The second or third attacks are usually marked by relative lack of response to digitalis. An increase of dosage at this stage tends to produce toxic effects, with nausea and bradycardia or else an irregular tachycardia as clinical manifestations. It must be stressed that this drug should not be given to patients whose failure is due to emphysema or gross anæmia, as it makes them worse. Many bronchitic emphysematous patients have been killed by digitalization. These warnings having been issued, we may proceed with some positive suggestions. One grain of digitalis three times a day is usually adequate for the first attack of congestive failure in hypertensive, ischæmic or valvular heart disease. After a few days, one grain twice daily is normally sufficient. Digoxin 25 mgm. may be substituted for a grain of digitalis with advantage in most cases. Digitalis alone is not sufficient for the elderly cardiac, however. It is advisable to administer

Mersalyl by intravenous or intramuscular injection as well. Two cubic centimetres is the usual dose, but some patients often benefit from 4-c.c. doses. This drug has a stimulating action on the cardiac muscle as well as its well-known power of inducing diuresis. Mersalyl works best when preceded by 30 grains of ammonium chloride. In the later stages of congestive heart failure in elderly patients, it often seems more potent than digitalis and may be started before digitalization begins. Where the congestive failure is due to emphysema, Mersalyl must be given with great caution as it reduces venous pressure, which is undesirable in such cases. The drug of choice in these patients is probably ouabaine, a strophanthus derivative. This increases cardiac output in about half the cases in which it is employed. By intravenous injection the dose of 1 mgm. may be given; by mouth the 2·5 mgm. tablets made by Nativelle can be used.

In cases of "cardiac asthma," paroxysmal nocturnal dyspnoea from left ventricular failure, it is best to start by giving morphia gr. ¼, intravenously if necessary. This should be followed by Cardophylin 0·28 gm., also intravenously. Where the patient has not had digitalis previously, digoxin can be administered with great benefit. Venesection is also useful in such cases to supplement the other measures designed to lower the venous pressure and to raise the output of the left ventricle.

The treatment of angina pectoris and coronary thrombosis does not differ whether the patient is old or young. It therefore needs no special consideration here. In cases where there is cardiac toxæmia, due to pulmonary or renal infection, digitalis must not be used. It appears to make the patient worse. The only measure to be added to the treatment of the original infection is the administration of small doses of brandy every hour or two. If there is a distended gut, tablets of carbachol may be given. (This drug must not be given intravenously.) The ultimate prognosis will depend on the severity of the original infection and its response to penicillin or the sulphonamides. Our object is to tide the patient over the critical stages of his illness and to assist the liver in its work of detoxication. One point in this connection is the difficulty which some old people have in using a bedpan. It is far easier for many of them to slip out of bed on to an adjacent commode without the effort, strain and consequent tachycardia associated with the unfamiliar bedpan.

Finally let me suggest that many cases of hypertension do not require treatment. To lower their blood pressure by thiocyanates or other means usually makes them worse and may precipitate either cerebral or coronary thrombosis. If there is vertigo, half a grain of phenobarbitone is often beneficial. Otherwise they are best left alone until there are signs of impending failure. A patient is happier without a cardiac neurosis during his later years.

CHAPTER XI

PROGRESSIVE CEREBRAL ISCHAEMIA

ELDERLY people who are beginning to "fail" often show changes in mentality or behaviour as the first sign of their deterioration. During the last few years a number of such patients have been studied at the Royal Hospital, Chelsea. Among them were two groups of cases which seemed to be associated with the presence of cerebral ischæmia. One of these, in which the condition remained stationary, appeared to correspond to the "relative hypotension" of Stieglitz (1935). This was one of the commoner forms of senile dementia. The other, described below, was progressive through three distinct stages to a fatal termination.

CLINICAL PICTURE

Of the twenty-seven patients in this series all but two were Chelsea pensioners. Their ages ranged from seventy to eighty-seven. Fifteen had but recently recovered from an infection of the respiratory tract; fourteen were suffering from congestive heart failure, which followed bronchitis or bronchopneumonia in seven of them; nine had had previous cerebral thrombosis; one had infection, cerebral thrombosis, and heart failure; while one had no known predisposing factor apart from hypertension.

TABLE 20.—*Predisposing Factors*

Recent infection	15
Congestive heart failure	14
Previous cerebral thrombosis	9
Infection and heart failure	7
Heart failure and cerebral thrombosis ...	4
Infection and cerebral thrombosis	4

The first change to be noticed was a vague or muddled state of mind in a patient previously lucid. Thought processes became irregular and sometimes delusions appeared. These might be of persecution by members of the staff or others, but often concerned the price of articles. For instance, one man asked for

£150 to buy a pipe and tobacco; another patient watered an imaginary garden with his urinal; while a third sprinkled his pudding with tobacco. Failure to recognise friends or relatives was also common. Members of the hospital staff might be addressed as brothers or sisters in error. At this stage the blood pressure was high in most of the cases recorded, but not so high as the previous normal. A fall from 230 to 170 mm. or from 205 to 195 mm. was the type of change noted.

After this came a stage of restlessness, often going on to violence, and usually worse at night. The most characteristic feature was a desire to get in and out of bed without reason. Automatic resistance to nursing or treatment was common.

In some cases the clinical picture resembled the condition known as "cerebral irritation," seen after head injuries. Two patients in this stage had to be sent to a mental hospital, but died in cardiac failure soon afterwards. The blood pressure in this phase was definitely lower than before, varying from 150/100 to 110/70 in patients previously hypertensive.

As the restlessness passed off the pulse became perceptibly weaker and the patient drifted into a terminal coma at systolic pressures between 120 and 75 mm. Diastolic pressures were always hard to determine at this stage, but one man showed 95/80 mm. as his last reading. His original figures were 180/90 mm. Another patient lingered for three days with no pulse palpable below the elbow, although his previous level had been 230/110. At this stage it was usual to find peripheral cyanosis and evidence of circulatory stagnation.

TABLE 21.—*Symptoms and Blood Pressure (in millimetres) of Typical Cases*

Case	Usual B.P.	Muddled or Delusional.	Restless or Violent	Comatose	Duration
5	?	120/90	110/80	95/–?	28 days
6	?	190/90	110/70	?	5 days
9	?	140/90	110/80	75/–?	1 month
11	205/140	195/100	130/80	105/60	13 days
15	230/110	170/110	?	brachial 0	2½ months
18	?	180/120	150/100	120/80	5 weeks
21	180/90	160/90	130/80	95/80	2 months
24	180/90	150/80	130/70	110/60?	2½ days
25	225/130	150/100	130/100	110/–	1 month
26	?	180/110	150/90	100/60	9 weeks
27	?	170/90	140/80	110/–?	5 weeks

DISCUSSION

The first cases in this series came to notice because their condition relapsed after apparently successful treatment. For example, patients with bronchopneumonia cured by sulphapyridine returned in congestive heart failure. This was treated by administration of digitalis and injections of mersalyl, which removed the œdema ; but the patients showed the succession of mental symptoms described, and died in spite of all efforts. It was then observed that many of them had been previously hypertensive or showed cardiac enlargement suggesting past high blood pressure ; so readings were taken at intervals. Unfortunately enemy action destroyed many of the earlier records.

The relation between a falling blood pressure and the appearance of cerebral symptoms in arteriosclerotic subjects suggests that progressive cerebral ischæmia is the basic pathology. This was mentioned by me in a communication (Howell, 1941) on the subject of heart failure in the aged. Subsequent cases, with more detailed study of the arterial tension, have gone to confirm this. Successive ischæmia of cerebral cortex, hypothalamic area, and medulla would be likely to give the symptoms described. Owing to the fatal outcome of this syndrome its recognition is of some prognostic importance to the practitioner.

CONCLUSIONS

A series of cerebral symptoms occurring in twenty-seven senile patients is described. A progressive fall in blood pressure accompanied the symptoms in every case which had such readings taken. It is suggested that the symptoms were caused by progressive cerebral ischæmia. The invariably fatal prognosis of this syndrome is stressed.

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CHAPTER XII

THE KIDNEY IN OLD AGE

THERE appears to be some difference of opinion among various writers about the efficiency of renal function in old age. The views of one school have been expressed thus : " Old age is considered by many to be a chronic, incurable disease, associated in large part with, or caused by, a diminution of kidney function." Others, like Hoffmann, state " Serious degrees of impairment of renal function is not a necessary accompaniment of old age." This divergence is still present when we consider such matters as the customary level of blood urea in later life or the specific gravity of the urine. The textbooks of physiology make little mention of old age ; the textbooks on gerontology have as yet few references to senile physiology. We therefore desire to record our own preliminary results for comparison with those of others as a pilot series for possible future investigations.

BLOOD UREA

Rappleye is quoted by Rolleston as stating that some 50 per cent. of 41 persons between 70 and 88 years showed an increase in blood urea. The range of blood urea nitrogen was 7·3 to 34·8 mg. per cent. Lewis and Alving give blood urea nitrogen figures rising from 12·03 mg. per cent. at 40 years to 17·62 mg. per cent. at 89 in a series of 99 men. Hoffmann records variations from 24 to 80 mg. per cent. of non-protein nitrogen in 15 patients between 75 and 89 years old. Laroche, Schulman, and Desbordes say that 16 out of 29 patients between 62 and 88 years had blood urea figures below 50 mg. per cent. while levels of 70 or 80 mg. per cent. were not uncommon without renal abnormality. Lipscomb quotes Christian as remarking that figures of 60 mg. per cent blood urea are common in the elderly. Carr gives 40 to 50 mg. per cent. as usual in healthy old folk, while Sutton writes " (Blood urea) tends to rise with age, and in elderly individuals it is possible for it to be as high as 50 or 60 mg. per cent without considering that renal impairment is necessarily present." Wright, however, says that 40 mg. per cent. is the normal level for older people with 50 mg. per cent. as the upper limit of normality. Stewart thinks that there is a tendency for the blood urea to be more often increased above the average for young people, but that no general progressive change occurs with advancing years.

The material for the present series of cases was made up of patients in the wards of a hospital for chronic diseases who were used as a control group for certain other investigations. All patients with known or suspected disease of the urinary tract were excluded, but the majority of the patients showed some degree of hypertension. In view of previous studies, this was not considered as pathologic. The series was made up of 103 cases, 60 male patients and 43 female. Their ages ranged from 65 to 94 years. The levels of blood urea in the 5 year age groups may be seen in table 22.

It will be seen from table 1 that these figures do not show an increase with advancing years. The lowest reading recorded, 15 mg. per 100 cc., was found in a patient aged 74. The highest, 58 m.g. per 100 cc., occurred in one person aged 79 and another aged 87. The patients over 90 years had figures of 32, 34 and 46 mg. respectively. Considering the remarks of Stewart (15), which suggested that the spread of readings becomes greater in old age, it was decided to tabulate the results by range and not by age. The effect of this is seen in table 23.

It can be seen from this that 31 per cent. of the figures are over 40 mg. per 100 cc., which Wright gives as the normal level for older persons. Only 6 per cent. are above 50 mg. per 100 cc., which the same authority (14) gives as the absolute upper limit of normality. The range here recorded would seem somewhat higher than the equivalent in Lewis and Alving's

TABLE 22.—*Blood Urea Levels and Age (5 Year Groups)*

Age Group	Number	Maximum	Minimum	Mean (mg. per 100 cc.)
65—69	10	42	20	34.0
70—74	34	54	15	37.1
75—79	20	58	18	35.6
80—84	18	56	20	38.6
Over 85	21	58	17	37.9
Total Series	103	58	15	36.9

TABLE 23.—*Range of Blood Urea Readings*

Blood Urea mg. per 100cc.	Number of Cases
Below 20	9
21—30	17
31—40	45
41—50	26
51—60	6

series, but is almost double the number of cases. It may be noted that both the mode and the median are here 37 mg. per 100 cc. This would suggest that the figures of most previous authorities are a trifle high, partly because of the small number of cases on which they have worked.

SPECIFIC GRAVITY OF URINE

Several of the writers already quoted have included the measurement of the specific gravity of the urine in their tests of renal function. Rappleye, for instance, gives a range of from 1004 to 1035 in his cases. Hoffmann's figures vary from 1004 to 1033. Lewis and Alving state that the specific gravity does not fall below 1026 before the age of 65. Above this age, it falls below 1026 14 times in 21 cases. The lowest figure in their series was 1018 in a man of 76 years.

The cases whose measurements are here recorded were all Chelsea pensioners entering the infirmary of the Royal Hospital during the winter of 1941 to 1942. The specific gravity is always taken in the early morning specimen on the day after admission. The number of readings here recorded is 101 from pensioners whose ages ranged from 65 to 93 years. It will be seen that the figures are lower than those of Lewis and Alving which were obtained from 12 hour specimens of urine (table 24).

TABLE 24.—*Urine Specific Gravity and Age*

Age Group	Number	Maximum	Minimum	Mean
65—69	15	1030	1005	1015.0
70—74	28	1030	1008	1016.4
75—79	34	1030	1006	1018.0
80—84	15	1025	1005	1017.6
85—89	7	1022	1012	1017.8
90—95	8	1015	1010	1012.5
Whole series	101	1030	1005	1016.8

It will be seen that the range of these readings is slightly less than those of Hoffmann or Rappleye, but not significantly so. There is a considerable diminution below the values of Lewis and Alving, however, but not the steady decline with advancing years which those authors found. The maximum figures fall a little over the age of 80, but the minimum readings do not alter very much. When we come to chart the variation of range of specific gravity, only 22 per cent. rise above a figure of 1021, and 25 per cent fall below 1010. This gives a wider spread than the usual for younger persons (table 25).

TABLE 25.—*Range of Specific Gravities*

S.G.Range	Cases
1005	4
1006—1010	21
1011—1015	20
1016—1020	34
1021—1025	15
1026—1030	7
	101

It will be seen from the above table that 54 per cent. of the readings fall in the group 1011 to 1020. The mean for the whole series is 1016·8, with a maximum deviation of 13.2. The mode is 1020, which represents no less than 25 per cent. of all the readings, but the median is at 1018. It would seem, therefore, that a cline in the specific gravity of urine is customary with the increase of age, but not proportionate to the actual number of years.

KIDNEY STRUCTURE

Having thus considered renal function, it was decided to take a brief glance at the structure of the kidney in old age. Textbooks, such as Boyd's *Pathology*, state that the kidneys are often contracted and grossly scarred. This organ, as Allbutt puts it, is " a starved, but not a corrupt kidney, sufficient for the smaller life of an elderly man." Oliver states, in Cowdry's *Problems of Ageing*, that past studies leave great uncertainty in the mind of the reader. He believes that a consideration of the arteriosclerotic kidney will describe in realistic terms at least the typical kidney that is found in aged man. This opinion is based on the study of 75 organs from individuals over 70 years old.

As a comparison with this, a series of 300 descriptions of kidneys in postmortem examinations on patients over 65 years of age were taken at random from our records. Apart from a large number of cases where no marked abnormality was noticed, three main types of organ were described. The first of these, labelled K1, showed a smooth outer surface. On splitting the kidney, the cortex seemed of normal width, but the arteries were somewhat thickened. The second group (K2) had depressed coarse scars most marked along the convex border, with the rest of the surface more or less smooth. The cortex was narrowed only in the parts where scarring took place, and there was patchy arterial thickening. This type corresponded with the classical senile kidney. A third class (K3) had a finely granular surface and cysts were often present. The cortex was narrowed in all areas, there was general arterial thickening in an organ usually smaller than normal, and excess pelvic fat was present as a rule. In a small number of cases there was a combination of the last two types (K2-3). It was noticed that the ease or difficulty with which the capsule could be stripped from the organ was of no significance.

It will be seen from table 26 that the largest class is composed of kidneys in which no marked abnormality was detected. Some of these organs were congested from cardiac failure, but none were scarred or granular. Next most frequent is the finely granular organ, and only third on the list comes the grossly scarred or deformed kidney, which represents but 14 per cent. of the present series. An organ of this kind was often found below the age of 70, while an apparently normal kidney could be found even at 88. This great variation in the appearance of the kidney in old age is a marked contrast to the descriptions in the text books including Cowdry's.

TABLE 26.—*Gross Appearance of Senile Kidneys*

Type	Appearance	Number	Percentage
N.	No. marked abnormality	140	47%
K1.	Arterial changes only	20	7%
K2.	Coarse scarring	41	14%
K3.	Finely granular	58	19%
K2.-3.	Mixed type	16	5%
	Gross structural disease hydronephrosis, growths, etc.	25	8%
		300	100%

When the microscopic structure of the organ was studied, it appeared to correspond with that of the gross appearance. Moore, however, is quoted in Cowdry's book as having made a quantitative examination. He is said to have shown that in the seventh decade the number of glomeruli equals only half or two-thirds the adult count.

As a rough comparison with this, 20 microscopic slides of kidney sections from patients over 65 were examined. It was found that each slide showed from 100 to 200 glomeruli. The piece from which these sections was cut had always been taken from the most interesting looking part of the organ, as a routine. A hundred glomeruli were counted from each slide and classified as either normal or abnormal. Any doubtful structures were classed as abnormal, so that the total count was probably on the pessimistic side of reality. It was found that the mean or average number of normal glomeruli counted equalled 67 per cent. The lowest number in any slide was 42 per cent., which occurred in a woman of 74. The highest figure was 83 per cent. in a patient of 86. The second highest total (78 per cent.) was present in a woman of 90 years and a man of 86. If this rough count is of any value, it would seem that the number of normal glomeruli do not necessarily diminish with the actual age of the patient. The findings of Moore, therefore, may be somewhat misleading.

DISCUSSION

Before discussing the findings recorded above, it must be clearly pointed out that the various parts of the investigation have been carried out at different times and in different places. They cannot be considered as parts of one co-ordinated investigation of renal structure and function deliberately undertaken. This is fact finding to point the way for future planned research.

As regards renal function, it would seem that the specific gravity of the urine shows greater deviations from the normal than the level of blood urea. Up to the age of 80 at least some of the pensioners could concentrate to 1030, but this fell later. Still, the mean figure of 1016·8, although lower than some previously recorded results, does not suggest that serious renal damage is usual in the elderly. When we turn to the figures for blood urea, these would seem to be more nearly normal than the majority of those previously quoted for old age. The mean 36·9 mg. per 100 cc., although a trifle high for younger patients, again would not indicate much structural alteration. In this connection, Wright states that three-quarters of the total renal tissue must be removed before the blood urea rises in animals.

Turning from function to structure, it is interesting to notice that very nearly half the kidneys examined showed no gross change in appearance. The most frequent pathologic appearance was a finely granular change, present in only about a fifth of the cases. Coarse scarring, previously described as the normal senile alteration, was found in one-seventh of those examined—a small proportion indeed. When an attempt was made to estimate the percentage of normal glomeruli left in a series of senile kidneys, about two-thirds appeared to be unchanged. If this were a fair random sample, one would not expect much impairment of function to be the rule in the aged. Incidentally, it is to be remembered that out of the 300 postmortem examinations mentioned, only 25 or 8 per cent., showed serious renal disease as a primary or contributory cause of death. It has been our experience that the kidney gets more than its fair share of blame for sickness and death in the aged.

SUMMARY

1. The blood urea in 103 old persons over 65 had a mean figure of 36·9 mg. per 100 cc. The maximum was 58 mg. and the minimum was 15 mg. per 100 cc. The level did not rise with age.
2. The specific gravity of urine in 101 Chelsea Pensioners aged over 65 had a mean figure of 1016·8. The maximum was 1030 and the minimum 1005. No significant fall took place in the older age groups.
3. In a series of 300 postmortem examinations on patients over 65, no gross renal change was noted in 47 per cent. of the cases.
4. About one-fifth of the cases showed finely granular surfaces and general diminution of the cortex.
5. The classical senile coarsely scarred kidney was found in only one-seventh of the cases examined.
6. In 20 microscopic slides of kidneys from old persons, the proportion of normal glomeruli averaged 67 per cent. There was no relation between the age of the subject and the number of normal glomeruli.
7. It would seem from these findings that advancing years are not regularly associated with structural or functional abnormalities of the kidney, which can be normal at 90 years.

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Note.—Since this was written, a case has been encountered in which the appearance of the kidney was normal in a subject aged 96.

CHAPTER XIII

GERIATRIC REHABILITATION

"When he is forsaken,
Withered and shaken,
What can an old man do but die"

THESE lines sum up the attitude of many old people on the subject of old age. Lacking training in the care of the aged from their professors, doctors often start practice holding this point of view. In consequence, a large number of elderly patients are wrongly considered as untreatable, and therefore neglected. Yet much may be done to restore cases of apparent senility and incurable disease to relative vigour in body and mind. Complete recovery is not possible in all patients, but once a planned system of rehabilitation is in being, some surprising results can be obtained.

The first essential in treating the aged is an optimistic atmosphere. This has a greatly stimulating effect on the patient and also on the relatives. It is important to gain the active co-operation of both if real success is to be achieved. No one can do much against the patient's will. In the same way, it is fatal to keep the old people in bed and to give them sedatives. The practice should be to get them up and to keep them interested. Small trips from one room to another, a few hours sitting outside in the sunshine, these give that added stimulus to life which is so important for successful treatment. It has been the experience of the writer that these conditions can easily be obtained in the home of the patient. Hospital conditions are not always essential for rehabilitation.

CHRONIC ARTHRITIS

It is the practice at the writer's clinic to treat most cases of rheumatoid and osteoarthritis with intra-articular injections of procaine lactic acid followed by manipulation. This is done once a week; and following the treatment, patients have a rest day as the joints may be slightly painful. On three days a week there is a class for remedial exercises in the gymnasium. Every attempt is made to interest the patient and to prevent boredom, for exercises carried out half-heartedly are anathema. Hence visitors are invited to watch the classes from time to time and the Geriatric Physician makes an informal inspection frequently. As a rule the movements are carried out to the music of a gramophone, except in the class for beginners who have just begun rehabilitation. Whenever possible, purposive actions and miming play are introduced. Imitations of a mechanical doll fanning itself, a cat washing its head and a scarecrow are very popular with the women. In the same way, throwing a ball, catching quoits and competition in emptying a jug of water by pumping a Higginson's syringe are great favourites with the men. The spirit of emulation is fostered as much as possible, as this produces increased activity by individual cases. Members of the nursing staff who watch their patients in the remedial exercise classes are astounded at the amount of effort and the range of movement of which they are capable. For most old folk can do much more than they realise.

All arthritic patients also do occupational therapy either in the wards (if they are bedfast) or in the occupational workroom. There are two routine sessions a week, but many old folk like to come up to the department on their own account between classes. It has been found, however, that few patients have the energy to have remedial exercises and occupational therapy on the same day. All the work in this department is, of course, prescribed by the physician. For exercising larger joints various types of loom are helpful. Heavy rug looms, requiring much shoulder movement as well as foot exercise are always in use. Often the work has to be divided between two patients, although this is not popular. Once an old person has got interested in a job, he does not want to share it with anyone else. Lighter cottage table looms are also valuable, as they involve movements by elbows, wrists, fingers and knees. The towels and tray cloths which can be made on them look attractive. Hence this work is popular with the women who prefer it to rug making. For those with arthritic fingers, knotted woollen rugs on a stringed frame give good exercise. Others prefer basket work to this, although it is more complex and strenuous to perform. Wax modelling is not popular, in spite of its value as an exercise to the small joints of the hand. For women with stiff ankles, a treadle sewing machine can be useful. One thing is forbidden to arthritic patients—knitting. This requires so little movement that many have grown stiff and ankylosed while doing it. It must be discouraged as a substitute for occupational therapy.

As patients improve, they are encouraged to do heavier work and to help with the routine of the wards. Men often like to work with leather, making bags, purses, and so on. Those with arthritis can benefit by using a broom to sweep the ward. Women can help with sewing and small repairs as well as by laying the table, washing up or drying and doing small errands for the sister in charge of the ward. For a neglected arthritic who has considered herself as useless, a little housework can be a great tonic. The greeting of one such out-patient: "Doctor, I peeled my potatoes yesterday!" meant a real spiritual uplift in her life. It was the dawn of independence. Of course, some patients are afraid of recovery. Illness has been a protective shield against the outside world. In these cases it is not enough to treat the patient. One must think about their whole life as well. At this stage psychotherapy is more than physiotherapy. Rehabilitation consists in finding a life fit for the patient quite as much as making the patient fit for life outside hospital or bedroom. It is therefore important to bring Social Welfare workers into the scheme of things as soon as recovery begins. Relatives who have regarded their Aunt Fanny as incurably crippled have to be interviewed. The situation must be explained to them and their help must be enlisted. Otherwise Aunt Fanny will put herself back to bed because life is so difficult outside it. In old age, rehabilitation must continue for a long time if it is to be really effective.

HEMIPLEGIA

The rehabilitation of the hemiplegic patient must begin soon after admission to hospital. Neglect during the first few weeks may give rise to deformities which will be impossible to remedy later. The weak arm and leg should be put in sling and spring extensions to prevent flexor contractures. The foot is encased in a stout canvas boot, which has small ringed attachments at the heel and toe. Using a balkan beam, the toe ring is attached to a 50 lb. spring which supports it vertically. The heel ring is fixed to a 50 lb. spring which extends it horizontally. For the arm, two Guthrie-Smith slings may be used, or a triangular canvas sling with a 30 lb. spring supporting it from above, while the other two corners are fixed to the top and bottom of the bed respectively. Thus knee and elbow are extended while light splints can secure extension of wrists and fingers. It is sometimes necessary to prevent flexion of the knee by using a broad bandage or sheet passing over the point and attached to the side members of the bedstead.

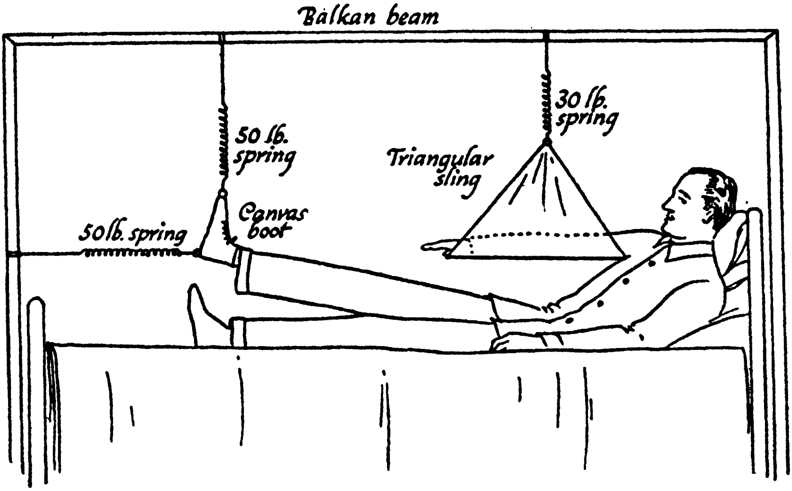

Fig. 9.
Hemiplegic Patient in Spring Extension

After a few days in an extension of this type, passive movements may be started. Each joint of the paralysed limbs must be put through its full range of movement at least twice a day. The patient must be encouraged to try and move arm and leg while in the slings. He can also grasp the wrist of the weak arm with the sound hand and raise it above his head. To prevent loss of power in the long muscles of the back, it is often beneficial to put the patient in a harness or waistcoat with tapes attached to waist and under the axilla (dorsally) on each side. These are fixed to two 50 lb. springs at the foot of the bed, which tend to pull the patient's back upwards and forwards. Leaning backwards against this pressure several times a day and then letting the spring pull the body forwards will exercise the muscles of the back and keep them in fair condition. This " Cosin's waistcoat ", so named after its inventor, is also extremely useful for rehabilitation of cases which have become bed-ridden from other causes.

The next stage is the faradic stimulation of the weak extensor muscles of arm and leg. This shows the patient that his limbs are capable of movement, although they are not yet under his control. The dread of paralysis is often greatly lessened by this. Secondly, the over-active pull of the flexor muscles is combatted so that contractures are less likely. Faradism to the extensors should be given twice or thrice a week for at least a month in order to overlap the end of spring extension on the hand and the start of active exercises on the other. The muscles are stimulated in bed for the first few treatments, but later the patient is out of bed in an armchair to receive his faradism.

We now come to active exercises. These should be started as soon as the patient is strong enough to sit in an armchair. In a mild case, they have begun after only one week in bed. More usually it is necessary to wait three or even six weeks. The chair is placed facing the foot of the bed and a wooden bar or plank is placed across the legs of the bed to give the feet purchase. The patient is told to grasp the paralysed hand with his healthy one and to place it on the rail of the bed. When a grip is obtained, the strong hand holds the rail beside the weak one. The patient is then told to pull himself forwards and upwards. He learns in this way to gain the standing position, at first with help, then alone. A few days later he is told to hold on with the strong hand and to lift the weak one. In the same way he holds with the weak hand and raises the strong one. The legs are then raised one at a time until the hemiplegic one has learnt to take the weight of the body. Soon after this the patient is ready to walk. Standing at the foot of the bed he turns either right or left, according to the side of his lesion, and takes his first few steps holding his bed-rail. As he gains confidence, he is exercised in a walking machine and then alone. At this stage he is allowed a walking stick held on the healthy side, so that it gives support when the weak leg goes forward. The strong limb needs no such support. Eventually the patient should be able to walk without a stick, at least for short distances.

While this treatment is being carried out in the ward, co-ordination exercises are given to classes of hemiplegic patients in the gymnasium. Tapping, pointing and lifting both hands and feet form the basis of these. Other exercises are added as the patients improve. Each class ends with a game of " chair football " between two lines of patients. Only the hemiplegic foot may be used for kicking the ball, though the other one may be employed to help it into position. Passing the ball from one player to another is encouraged and a goal is scored by kicking it through the gap between the chairs of the opposing team. This game appeals to the patients enormously and there is always great discussion about the match after each gymnasium class.

When a hemiplegic or arthritic patient has improved enough to be able to look after himself partially, he is encouraged to take a day's leave from hospital to spend with his family. This trial trip often provides useful information both to patient and physician. Later, a week-end pass is arranged, so that when the day of discharge at last arrives, the novelty of leaving hospital is not too overwhelming. When possible, small parties of patients in wheel chairs are taken to the cinema by arrangement with the local manager. If the weather is fine, such groups can be wheeled out of the hospital on to the neighbouring common. Once or twice during the summer a number of semi-ambulant cases go for an outing in an omnibus. In these ways contact with the outside world is maintained and the " institution complex " is prevented.

OTHER DISEASES

The practice at St. John's Hospital is to encourage as many patients as possible to get up out of bed. The question asked of any disability is not " what is wrong ? " but " why can such and such a function not be performed ? " All excuses for immobility are approached in this spirit and a remedy sought at once. The results are sometimes surprising. In one block, where 56 patients were constantly in bed, this approach allowed no less than 49 to get up within three weeks. Two months later, some 36 of these were discharged. Even cases with new growths seem much happier when allowed out of bed for part of each day and given chances to think of other subjects than their own ailments. Patients with cardiac failure can be nursed in tall armchairs once they are past their most acute phase. At the Royal Hospital, Chelsea, the writer once reduced the proportion of patients in bed to 2 % of the total. While this was most unusual and fortuitous, it does show what can be done with a favourable combination of circumstances. It seems best to aid rehabilitation by grouping patients in wards by functional recovery rather than structural lesions. Thus there can be ambulant wards for those who get up and about most of the day, which may contain recovering hemiplegics, mobile arthritics, convalescent pneumonic patients and so on. These need the minimum of nursing staff and thus release skilled help for employment in the more " acute " sections. Promotion to such a ward often has a stimulating effect on the morale of an elderly patient and arouses his desire for emulation. Thus the mental rehabilitation is encouraged as well as physical. This effect ccn be increased by bright colours in the ward scheme of decoration, cheerful pictures on the walls and, above all, the proper outlook from the windows. To see active life going on outside the hospital urges patients to get better and join it once more. A dull gloomy view does the opposite.

As may be seen from the foregoing account, it is possible to carry out rehabilitation of many elderly patients. Although a start has been made, much remains to do in this field. The problem of contractures, for example, remains unsolved. The rehabilitation of those previously considered as incurable is going to be one of the great adventures in the future.

CHAPTER XIV

THE INCIDENCE OF CANCER IN OLD AGE

CANCER is probably the second or third most important cause of death in old age, giving place only to cardiac disease and possibly cerebral vascular accidents. According to the statistics of the United States Department of Commerce, quoted by Thewlis, cancer is stated to be commonest between the ages of 55 and 74. Yet, on the postmortem table, new growths are found with considerable frequency even up to the age of 100. Clinical statistics, however, are less reliable than pathological ones. For this reason it is difficult to compare the figures on incidence of new growths from different sources. Nevertheless, an attempt will be made to discuss the frequency of cancer in Chelsea pensioners the statistics of the Register-General and certain autopsy findings from a large general hospital.

THE ROYAL HOSPITAL, CHELSEA

When the causes of admission to the infirmary of the Royal Hospital, Chelsea, were analysed, cancer accounted for some 187 cases out of a total of 4770. The age of these patients is given in Table 27 below. The commonest site was the digestive tract, 45·1%, in which stomach growths were more frequent than colonic or rectal neoplasms, followed by buccal cavity, 26·4%. Since all the pensioners are seen daily by a nurse and have a weekly medical inspection, they have every opportunity to bring their complaints to the notice of the medical authorities. Yet a large number of new growths are so advanced before admission to the infirmary occurs that the period of survival after diagnosis is often short.

TABLE 27.—*Age of Cancer Cases in Chelsea pensioners.*

Age.	Total Cases	Percentage
Below 60	8	5·7%
61—65	16	11.4%
66—70	41	27.7%
71—75	39	27.2%
76—80	24	16.9%
81—85	10	6.9%
86—90	5	3·5%
Over 90	1	0.7%
	144	100.0%

TABLE 28.—*Period of survival after diagnosis*

Period	Cases
Less than one month	27
One to three months	47
Four to six months	11
Seven to twelve months	6
One to two years	6
More than two years	4
	101 (Total cases followed up)

Speaking clinically, it is harder to diagnose cancer in old age than in middle life. Owing to the presence of multiple pathology, the symptoms of the new growth are often overlaid by other disease conditions which mask them. One old lady with an enlarged thyroid and auricular fibrillation had oedema of the legs and ascites. After diuresis, a mass in the stomach with secondaries in the liver became evident. Sometimes a patient who has a new growth really dies of a secondary condition. An old man with a carcinoma of the rectum suffered much more with, and died from cardiac failure and chronic bronchitis. In fact the common termination of many neoplasms is a final bronchopneumonia which kills off the weakened patient. About a third of all cases provisionally diagnosed as " Old Age " or " Debility " turn out to be suffering from new growths in the end, so that these terms must be viewed with suspicion. In the absence of an infection, a raised sedimentation rate may be the first clinical sign of a new growth. This is more likely if secondaries are present or if tissue breakdown is taking place. Sometimes, however, a low sedimentation rate is present with new growths of the stomach or colon, especially if there has been vomiting or diarrhœa.

REGISTRAR GENERAL'S FIGURES

In the official causes of death (1946) cancer accounted for 75,407 persons out of a total of 489,054. Some 40,000 of the former group were aged more than sixty-five years old. The age distribution is given in Table 29 below.

TABLE 29.—*Age and Death from Cancer*

Age	Males	Females
65—69	6,418	5,740
70—74	6,639	5,812
75—79	4,763	4,609
80—84	2,114	2,819
85+	724	1,353
	20,658	20,133

Women suffered less than men from new growths in almost all sites except the breast. This difference was most marked in the buccal cavity, and to a lesser extent in the digestive tract. The former sites claimed 1396 men over the age of sixty-five compared with only 326 women. Other sites which showed sex differences were the lungs and pleura, with 2059 men against 697 women, and the skin where there were 360 men and 310 women over sixty-five. The relative frequency of cancer in different parts of the digestive tract is not without interest as may be seen from Table 30.

TABLE 30.—*Cancer of Digestive tract, over 65 years*

	Men	Women	Total
Oesophagus ...	1,001	518	1,519
Stomach Duodenum ...	4,164	4,029	8,193
Intestines	3,153	4,002	7,155
Rectum	2,542	1,521	4,063
Liver Bile Tracts ...	741	921	1,662
Pancreas	778	755	1,533
	12,379	11,746	24,125

ST. JAMES' HOSPITAL, BALHAM

During the years 1930 to 1947 Dr. A. P. Piggot performed some 2,000 post mortems on patients aged more than 64 years, and 710 of these were aged 75 or over. New growths were one of the commonest causes of death accounting for 191 cases.

The cases (which have been taken from this series) were selected on account of interest. This means that in many patients in whom the diagnosis was obvious did not come to post mortem. Hence the distribution of new growths will be somewhat different from those previously mentioned. The main value of this series lies in the fact that the site of the growth was verified at post mortem and the nature confirmed histologically. The commonest place in which cancer was found was the large intestine. Next came the stomach, the bronchus and the œsophagus and the pancreas in that order. Other structures which were involved from time to time included the bile passages, the prostate, the bladder, the uterus, the larynx, the small intestine, the breast and the peritoneum. These are shown in Table 31.

TABLE 31.—*Site of new growths*

Large intestine	46
Stomach	34
Bronchus	17
Oesophagus	15
Pancreas	13
Bile Passages	9
Prostate	7
Bladder	6
Gall Bladder	6
Small Intestine	5
Uterus	5
Larnyx	5
Breast	4
Peritoneum	4
Liver	4
Ovary	4
Kidney	2
Pharnyx	1
Lung	1
Suprarenal	1
Thyroid	1
Melanotic Sarcoma (generalised)	1
	191 (out of 710)

As far as age is concerned, the eldest patient was aged 93. Among those cases aged 80 or over 25% had a new growth out of a total of 240. Between 75 and 80 28% of 470 patients showed malignant neoplasms. The growth was not the cause of death in 14 patients and in two cases the patient was afflicted by two separate malignant tumours. It did not seem from this series as if malignancy diminished over the age of 75, but as has already been stated this is a selected series of cases and therefore unreliable for this purpose. The important thing to realise is that cancer is one of the great pathological problems of old age, and must always be remembered even when the diagnosis appears obvious.

CHAPTER XV

DISEASE IN OLD AGE

HIPPOCRATES said: "Old men suffer from difficulty of breathing, catarrh accompanied by coughing, strangury, difficult micturition, pains at the joints, kidney disease, dizziness, apoplexy, cachexia, pruritus of the whole body, sleeplessness, watery discharge from the bowels, eyes and nostrils, dullness of sight, cataract, hardness of hearing." It is interesting to compare this formidable list of complaints with an analysis of the provisional diagnosis in 4,622 Chelsea pensioners who were admitted for treatment to the infirmary of the Royal Hospital.

TABLE. 32.—*Provisional diagnosis in Chelsea pensioners*

Disease.	Percentage
Bronchitis	13.5
Old age, debility	11.6
Myocardial degeneration	9.5
Influenza	7.8
Digestive disorders	7.7
Rheumatic diseases	6.1
Other cardio-vascular	6.1
C.N.S. lesions	5.1
Pneumonias	3.1
Cancer	4.3
Genito-urinary	3.4
Other diseases	21.7
	100.0% = 4,622 cases.

When we compare these figures with the entries on the death certificates at the Royal Hospital for the years 1918-1923, we find that the order is different. First now comes myocardial degeneration, second pneumonia, third cancer, closely followed by cerebral vascular accidents, bronchitis and influenza. Since cases of cardiac failure made up nearly a quarter of the total, they were analysed more precisely. It was then found that over half of them (67 out of 128) had followed either bronchitis or pneumonia. In the days before the use of penicillin and the sulphonamides, this sequence of respiratory infection—cardiac failure was extremely common in old people. This preponderance of cardiac causes of death in the aged is also supported by the figures obtained from the series of autopsies mentioned in chapter XVIII. The post mortem findings suggest that we are far from having solved the mysteries of cardio-vascular and myocardial degeneration among elderly subjects. Is the presence of atheroma in the aorta sufficient, by itself, to cause death ? What is the explanation of the varied and different changes in the myocardium of aged people ? Fibrosis seems to be associated with disease of the coronary arteries ; but friability, softening and fatty changes have no such clear connexion. There seem to be several clinical syndromes of vascular failure accompanied by a falling blood pressure, one of which is described in chapter XI. The morbid anatomy of such cases, however shows no regular constant pattern. It is clear that in this field of medicine alone, there is scope for much further investigation.

In other systems also there seems to be great variation between symptomatology and morbid anatomy in old people. Many new growths of the digestive tract are not suspected during life. The old soldier who simply fades away is often found to have had a carcinoma of stomach or colon or rectum which caused him little distress apart from physical weakness. In fact, an elderly patient who complains of dyspepsia usually has a gastric ulcer, with the normal time relationship between food and pain completely absent. A number of cases which show either an active ulcer or the scar of an old one at autopsy have never complained of any digestive symptoms at all. They seem to be analagous to those patients with silent coronary occlusion who are encountered from time to time among the aged. Another comparable discovery is a patch of cerebral softening in someone who has shown no neurological signs during life. Occasionally the reverse occurs and a patient, diagnosed as hemiplegia due to cerebral thrombosis, reveals no obvious lesion near the internal capsule. Another incongruous comparison may be made sometimes between the occurrence of urinary retention during life and the degree of prostatic enlargement found after death or at operation.

SECONDARY DISEASES

Medical students are usually taught that all the signs and symptoms which a patient has must be fitted into one diagnosis. This is often impossible in patients over sixty.

Mrs. B. aet 85 came to the writer suffering from pain in the shoulders, which was due to fibrositis. She later complained of pain in her abdomen, with marked tenderness near the tip of the ninth right costal cartilage. This was diagnosed as cholecystitis ; but a few days later, she developed a cough, dyspnoea and pain in the chest. On examination, signs of consolidation at the right base were found. Shortly after her rerecovery from this complication, there was marked oedema of the ankles, legs, and hands, which responded to injections of mersalyl.

In this case, it is possible to suggest that the inflammation from the gall-bladder caused an associated basal pneumonia and that the cardiac failure was secondary to these conditions. But sometimes the sequence is not so easy to work out.

A Chelsea pensioner aged 68 had a fungating wart on his foot. This turned out to be a " Nævo-carcinoma " when sectioned at the Middlesex Hospital. The following year, he showed ulceration of the right tonsil, which was diagnosed histologically as " a squamous cell " new growth. Two years after this he was suffering from auricular fibrillation and early cardiac failure. Admitted to hospital, he died with a cerebral thrombosis.

Here, two different types of cancer within a year, followed by a disturbance of cardiac rhythm and terminated in a cerebral vascular accident cannot be easily linked. In the post-mortem room secondary diseases are found even oftener than they are diagnosed during life. In a small group of patients, all aged eighty, the following secondary conditions were encountered : Hydronephrosis, old coronary infarct, in one ; Carcinoma of the rectum and broncho-pneumonia in another who died with a carcinoma of the œsophagus ; Bronchiectasis and a renal infarct in a case of hypertensive heart failure ; Bronchiectasis, duodenal ulcer and cirrhosis of the liver, together with an enlarged prostate in a man who died from peritonitis from a perforated gastric ulcer. All these findings were additional to the common cardiovascular and pulmonary changes which may be found in the majority of elderly subjects. It is usual for patients of this age to have six or seven lesions recorded in the post-mortem book, not the single disease process expected in younger people.

From the examples given above, we can see that maladies of old age may be acute or chronic. Some of the acute disorders common in early life are unusual after sixty. Most of the chronic conditions, however, are more frequent after that age. Put in another way, this means that the bulk of the " long-term sick" are elderly. Hypertensive and coronary heart disease, chronic rheumatoid and osteo-arthritis, cerebral thrombosis, chronic bronchitis, senile dementia and cancer provide the greatest clinical and administrative problems in a country whose population is growing older. Several of these conditions have been discussed in the previous chapters of this book. Others pose questions which still await an answer. But, in addition to these, there are certain riddles of old age which are hardly even formulated as yet. Dr. Sheldon has recognised the existence of this state of affairs in his book on the Social Medicine of Old Age. How do old people fall ? Why do old people fall ? What makes them frightened of traffic and crowded streets ? How does senile vertigo arise ? Is senile tinnitus a problem of the ear or the blood vessels ? Why do the elderly catch their feet easily on mats or rugs ? Is the reaction time slower in age than in youth ? In what way does senile tremor differ from Parkinsonism ? Are old folk unable to see well in the dark? Can the lack of will to live cause death ? These are all important questions which badly need an answer. Several of them are related to that common injury, the fractured femur. Few, if any, have been investigated, even superficially. There is need for a host of tests of function in different systems, to supplement the ordinary clinical methods of examination.

In the past it has been customary to suggest that the changes of old age are all due to one unitary cause. Among more recent writers, Korenchevsky would implicate the endocrine orchestra ; Bogolometz blames the reticulo-endothelial system. Formerly Lorand spoke of the thyroid as the main agent ; Metchnikoff wrote on auto-intoxication from the gut ; Lacassagne stated that old age was a disease of the colloids of the organism. The wide variety of changes found in the body of elderly subjects, even those who might seem to have died a "physiological death", make it seem extremely unlikely that only one single factor is responsible. When we add to this the difficulty in deciding which changes are due to age alone and which to disease, the complexity of pathology in subjects over sixty or seventy becomes great. Our knowledge of such matters is still in the descriptive stage which medicine and physiology left behind in the eighteenth century. On social grounds alone, it is important to advance them beyond this.

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CHAPTER XVI

SOME CLINICAL SIGNS

One of the more difficult feats in medicine is the correct assessment of physical signs in an elderly person. The presence of a harsh systolic murmur suggests rheumatic or congenital heart disease in youth. Over seventy, such finding is of little significance. Brown pigmentation of the skin raises the possibility of Addison's disease in maturity : it is almost physiological during old age. Muscular wasting in the hands may be the first sign of progressive muscular atrophy : it can also occur in healthy senescence. Let us then consider some of the signs which may be present in the normal aged subject.

As we have seen in previous chapters, arterial thickening is usual with advancing years. Tortuousity and calcification are not indications with a bad omen. Vascular accidents seem to occur more frequently in those with moderate thickening, than in the men with " pipe-stem " arteries. A raised blood pressure is also the common accompaniment of health and activity in many elderly men and women. The significance of a falling one will be discussed later. A moderate tachycardia or bradycardia is unimportant over the age of seventy, unless other signs are present to suggest cardiac incompetence. Slow auricular fibrillation can sometimes remain established without impairing the customary activity of an aged person.

In the lungs, moist rales, rhonchi and sibili, may be present at the stage when an elderly subject becomes infirm. Before that time, such findings usually indicate either bronchial infection or an enfeebled myocardium. Many emphysematous men show fine dilated venules at the rib margins. Sometimes larger apparently dilated veins may be seen coursing over the chest wall. These are not indications of disease within the thorax, but may accompany normal health. In the same way, the presence of large veins on the surface of the abdomen has no grave significance. Quite a number of elderly persons develop a hernia late in life. This can grow to a large size in some cases and may become strangulated. The association of chronic bronchitis and inguinal hernia in men is common. In those who have spent much of their life in tropical countries, an enlarged liver is common—37% of Chelsea pensioners. Two possible factors to account for this are past tropical disease, notably amœbic hepatitis, and cirrhosis. No case of a palpable spleen in a healthy old person has been encountered. Sometimes there is a palpable mass in the left iliac fossa. This may be the descending colon which is loaded with fæces in a constipated subject. It may also be the sigmoid colon which is the site of chronic diverticulitis and associated pericolic changes.

The findings in the central nervous system of the elderly are described in chapter VII. It only remains here to point out two common clinical pictures which are compatible with normality. Once upon a time, a new " recruit " was admitted to the Royal Hospital, Chelsea. On examining this man, I found contracted pupils which did not react to light or accommodation, absent knee and ankle jerks, a small chronic ulcer on the great toe, lack of vibration sense and dysmetria on trying to touch his nose. These changes suggested a diagnosis of Tabes Dorsalis. Yet further investigation and the future progress of this man did not confirm the original label. All the signs were, in fact, consistent with health in an aged subject.

Another old man was found to have fibrillary twitching of the pectoral, deltoid and gluteal muscles. There was marked guttering between the metacarpal bones, with wasting of the small muscles. It was difficult to elicit any of the tendon reflexes, but the plantar response was normal. After watching this and similar cases for a long period, it was felt that these findings also were within the limits of normality over the age of seventy-five. These two syndromes have been labelled provisionally as senile pseudo-tabes and senile muscular atrophy. Minor variations of these two clinical pictures are not uncommon in old age.

PHYSICAL SIGNS IN DISEASE

The ordinary routine examination of a patient over the age of sixty needs a few changes in order to ascertain the true state of affairs. A search must be carried out with the queries of degeneration, chronic infection, ischæmia and cancer at the back of the examiner's mind. The preliminary survey needs to be searching, since much may be learnt from the manner of sitting, standing, moving, breathing and speaking. Facial contours, complexion and expression can tell the observer a great deal. The texture of the skin, prominence of blood vessels, their pulsation, the colouring of lips, ears or extremities all give help in estimating the soil in which disease may have taken root. Comparison of the chronological age with the apparent one is often a helpful procedure. In fact, the general inspection is perhaps more important than all the rest of the physical examination.

When examining the mouth, it should be remembered that the presence or absence of teeth is more vital than the presence or absence of infection. Dyspepsia is commoner in the toothless than in those whose oral state is foul. Removal of infected teeth in old people only occasionally coincides with a turn for the better. Many elderly folk never get used to dentures, so that possession of false teeth does not always indicate their use for mastication. Some natural teeth in the jaw are worth more than a denture taken out of the mouth before meals.

Since most old people are emphysematous, the examination of the chest by clinical means is often not informative. It is often difficult to locate the apex beat and cardiac impulse. Percussion of the cardiac dullness does not coincide with the outline of the heart found on the orthodiagram at X-ray. The murmurs revealed on auscultation indicate atheromatous patches on valve cusps more often than stenosis or incompetence. There is usually more evidence of bronchitis at the lung bases behind and the mid-zones in front than in other parts of the chest. Clinical signs alone often lead the examiner astray unless supported by X-ray. Many pneumonias are called bronchitis, as neither temperature nor pulse rate are safe guides in this differential diagnosis, where emphysema and bronchial spasm mask the signs of consolidation. In fact, a quick grunting type of respiration is sometimes the earliest sign of pneumonia in an aged person. Any doubtful case should be X-rayed, as this is often the only form of examination which yields positive results. By this means the concealed consolidation may be recognised and the unsuspected carcinoma of the bronchus can be diagnosed.

When considering the cardio-vascular system of the elderly, it is advisable to start at the periphery and work towards the centre. The appearance of the fundus oculi may give an indication of the state of the arteries which is helpful in assessing the state of the patient. As age advances, it is common to find arteries which are thickened and tortuous, but which narrow near the edges of the field. Many such vessels show irregularities in the lumen of the artery. This finding was present in 60% of one sample of aged men. Another picture which may be seen is that of narrowed vessels which run more or less straight without irregularities, and which tend to branch in a regular fashion. This was found in 32% of the series mentioned above. The condition of the vessels in the fundus has no relation to the presence or absence of a high blood pressure.

This matter of the blood pressure must be considered next. As we have seen, some degree of hypertension is common in later life. A gradual rise in systolic pressure, with a smaller increase in diastolic figures was characteristic of the age groups in the "Chelsea control" series of 341 old men mentioned in Chapter VI. Similar changes have been found in a number of old women since used for purposes of comparison. It is therefore difficult to decide what significance to allot to the findings of thickened arteries and a raised systolic blood pressure in a patient over the age of seventy. The pulse pressure in the healthy aged is usually considerable, figures of 100mm not being uncommon. A low or decreasing pulse pressure, however, is more often the accompaniment of failing peripheral circulation and therefore of bad prognosis. To be of real value, blood pressure readings should be taken at regular intervals, over a considerable period of time. Variations of twenty or thirty millimetres in the systolic pressure from week to week are quite normal under these circumstances and can be disregarded. A steady rise, or more important still, a steady fall are much more momentous findings. Infections always seem to cause some drop in the systolic figure. This may be as much as 50mm in lobar pneumonia, 25mm in enteritis or 20mm in bronchitis. On one occasion it was noted that a very hot day was associated with 10 or 20mm fall in every subject examined, compared with his known normal. Wasting diseases usually demonstrate a steady fall in systolic levels : so do the later stages of the "low-output" types of cardiac failure. The stage of recovery from infections is accompanied by a return of blood pressure to its previous figure. In those with considerable arterial thickening, however, there seems to be a critical point at about 110mm Hg. below which recovery rarely takes place.

Old people often look pale. This may be due to real anaemia, but can also be associated with the absence of dilated capillaries in their face or hands. A blood count in such cases often shows relatively normal figures for red corpuscles and hæmoglobin. It is doubtful whether there is such an entity as " senile anæmia ". A number of different blood diseases can occur in old age and these may vary somewhat from the customary pattern. There is a tendency to show a hyperchromic picture more often than expected. Such a film may be seen as an isolated incident or phase in aplastic anæmia, for example. When anæmia is associated with the presence of an enlarged spleen, the diagnosis will usually be lymphatic leukæmia. The myeloid type is extremely rare over the age of sixty-five, only one case being found in over 2000 autopsies. As a clinical test, the blood sedimentation rate can be very useful provided that its limitations are recognised. The values for normality in the aged are somewhat wider than those of earlier life. If the Westergren method be used, figures of 12—15mm in the first hour are customary for healthy old people. Very occasionally an extremely high figure of 80—100mm is found without obvious cause. If the test be repeated at a later date, a normal reading may result. Malignant growths usually show an increased rate. One exception seems to be carcinoma of the stomach in the presence of vomiting ; or of the colon with diarrhœa. Chronic bronchitis may have a rate of 20 or 30mm in active phases. Certain types of arthritis, of course, show figures up to 100mm in the hour during an exacerbation. Here the test is significant as an indication of treatment.

It is hoped that the foregoing short account of certain physical signs to be found in elderly patients will be of assistance in the attempt to distinguish physiological variation from pathological indication. The clinical manifestations of disease in the aged are usually less than the actual morbid lesions which can be revealed at autopsy. Hence it is never a waste of time to investigate a case thoroughly. The difficulty is to assess the signs which have been elicited, then to substract those which are not significant of disease. The French maxim " Toujours les malades " is not enough in Geriatrics. We must be familiar with the healthy as well.

When possible, it is preferable to watch patients at their ordinary routine of life rather than on special consultations or ward rounds. Such things as their mental reactions, amount of customary physical exertion, appetite, gait, posture when sitting, standing or lying, all give some indication of condition. Mrs. J. says that she cannot move her arm to the doctor when he speaks to her. Half an hour later, observed from the door of the ward, she is seen to raise it to her face. As a general rule old folk can do more than they think they can or admit they can. The habitual facial expression of a patient can be seen to alter as his condition changes. The study of physiognomy in old age as a guide to prognosis has much to commend it. The hollowed cheeks, sunken eyes and greyish look of the dying patient are well known, but lesser grades of these and similar changes can act as warnings before more gross signs make their appearance. In the same way, a series of minor complaints in a patient who is normally cheerful sometimes herald a dramatic worsening of his condition, such as the occurrence of a cerebral thrombosis or the onset of cardiac failure. Generally speaking, diminution of muscular tone is a sign of a turn for the worse in an elderly person. This may be shown in the face, by the voice, by the myocardium in the form of a falling blood pressure, or in the general posture of the body in bed. The important decision is not where the patient is standing in the course of life, but the direction in which he is going and at what speed. Finally, it is important to remember that the aged have only managed to survive by reason of the tenacious grip they hold on life. Time and again they surprise everyone by their powers of recovery, so that a little optimism in prognosis is often justifiable.

CHAPTER XVII

MORBID ANATOMY OF OLD AGE

WHEN the causes of death in elderly and aged patients are sought by post-mortem examination, it is often seen that there are several morbid processes concerned. For instance, most subjects over the age of sixty have some degree of atheroma in the aorta and coronary arteries. Many show changes in the kidney substance, gastric ulcers, myocardial degeneration, patches of cerebral softening, enlargement of the prostate and so on. It is sometimes difficult to be precise in naming the actual cause of death for this very reason. It is the writer's custom to cross-index the pathological lesions found at autopsy under some thirty odd headings. Usually seven or eight entries have to be made; sometimes twelve or more may be necessary. Occasionally the total sum of morbid anatomy is not sufficient to account for the patient's decease. These cases suggest that there must be a form of physiological senile disturbance which is too subtle to be revealed by the knife of the dissector.

The commonest lesions in the elderly are found in the cardiovascular system. In a series of patients over the age of eighty, there was marked atheroma and calcification in the aortas of more than two-thirds of the subjects. Most of the remainder showed moderate atheroma. Among the cases below eighty, but over seventy-five,the proportion of these two groups was almost equal. The changes in the coronary arteries were parallel with those in the aorta, showing more calcification with increasing years.

When we consider the condition of the heart muscle we find that it appears more or less normal in about half those examined. The commonest abnormality is a generalised fibrosis, usually more marked in the left ventricle than the right. This seems to be associated with atheroma or calcification of the coronary artery and its branches. Sometimes the muscle is soft and friable, shredding under the fingers, easy to break into fragments. Here the correlation with the coronary circulation is not so clear cut. Occasionally the heart feels greasy or fatty. There may be actual fatty infiltration between individual muscle fibres so that the wall of the right ventricle becomes perilously weak. From time to time, patients possessing this lesion rupture their heart by sudden exertion and die. Brown atrophy of the heart is found in a certain number of aged subjects, but is not among the commonest phenomena. (Only 12% of a recent series of 164 cases over 80 showed this finding, which also occurs in wasting diseases in the younger). Scars of past coronary infarcts are seen not infrequently; often where there has been no past history suggesting a lesion of this type. This supports electrocardiographic evidence that silent coronary "insults" can and do take place in elderly patients. As might be expected from the incidence of hypertension, myocardial hypertrophy is common. Dilatation, however, is found less frequently.

Minor thickening of the cusps in the valves is quite common and probably accounts for many of the murmurs which arise in the senile heart. Among the cardiac lesions compatible with a long life, mitral stenosis deserves special notice. Several cases in the late eighties or early nineties have come to the notice of the writer during the past two years. Aortic disease of rheumatic origin seems to be rarer, but small patches of thickening, atheroma or calcification in and around the aortic cusps are fairly common. Lesions of the tricuspid and pulmonary valves are unusual in old age.

After the cardio-vascular system, the digestive tract has the greatest number of lesions in the elderly. As we have already seen, many new growths have their origin in the stomach or intestine. In addition to these, gastric ulcers are found with considerable frequency, and duodenal ulcers occur from time to time. Many such lesions have been silent during life and were never suspected. In other cases the character and periodicity of the pain was far from classical, so that they were provisionally labelled as "dyspepsia" or "gastritis". Such ulcers sometimes bleed profusely and cause death from anæmia. On other occasions they perforate the wall of the viscus to cause general or local peritonitis which is fatal. In these cases, again, the syptomatology is often very obscure and the pain less than might be expected. Hence they may reach the post-mortem room without clinical diagnosis. Another cause of death which accounts for a number of elderly subjects is some form of intestinal obstruction. Strangulated hernia, volvulus, obstruction by bands or adhesions, all these are found in old age. Diverticulosis is so frequent as to be almost a physiological variant: but diverticulitis may be either an immediate or remote entry on the death certificate. Perforation, gangrene, associated peritonitis, pericolic abscess, adhesions, stenosis with obstruction or ulceration may all complicate this lesion. Cholecystitis is common among the aged and may be fatal. The liver itself, on the other hand, rarely shows any pathological changes apart from secondary growths, congestion or cirrhosis. Similarly the pancreas is usually normal, though acute pancreatitis is not unknown. At times a fatty infiltration of the organ may be encountered.

The kidneys may be normal, even over the age of ninety. Alternatively, the changes described in chapter XII may be found. A true chronic nephritis is extremely rare. Infections of the urinary tract such as pyelonephritis are common, both as transient disease and as the cause of death. They are usually associated with a chronic cystitis added to an enlarged prostate in men or a cystocoele in women in the latter case. It may be noted that atheroma of the main renal artery is most infrequent. When it occurs, the site is always close to the origin from the aorta. Arterial changes in the smaller branches tend to be patchy in their distribution, so that a fairly high percêntage of normal functioning glomeruli can be found histologically.

Pathological lesions of the lungs occur in a fair number of those coming to autopsy. The commonest finding is probably some degree of pulmonary oedema, which complicates the terminal stages of many disease processes, such as cancer, cerebral hæmorrhage, bleeding peptic ulcers, intestinal obstruction and so on. It also takes place in myocardial failure affecting the left ventricle, even when clinical paroxysmal dyspnœa was not a marked feature of the case. The most frequent respiratory cause of death is broncho-pneumonia, which may also be a complication of other disease processes. Lobar pneumonia is found from time to time, but is less common than in earlier life. The scars of old pulmonary tuberculosis are often seen at the apices of the lungs. Active fibro-caseous tuberculosis is not rare and miliary disease of the lung occurs occasionally. Chronic bronchitis is found in many elderly men, but few women. At times it is the actual cause of death; more often it is the precursor of a fatal cardiac failure. Some cases of this sort show great hypertrophy of the right ventricle—the true chronic cor pulmonale. Most elderly patients show emphysema. Over the age of eighty, the atrophic variety is commoner: below this, hypertrophic emphysema is usual. At sixty, atrophic emphysema is rare. Bronchiectasis in the aged is less common than might be expected, and is usually a complication of chronic bronchitis. It is not unusual to find some pleural thickening or adhesions, often without any past history of disease of the lungs.

Gross lesions of the central nervous system account for quite a number of deaths in old age. Cerebral hæmorrhage or cerebral thrombosis are the common findings in these cases. The middle cerebral artery seems more prone to atheromatous degeneration than other branches of the Circle of Willis and the basal ganglia are the most usual sites of softening. Occasionally there is rupture of a berry aneurism, but more often the actual site of the vascular lesion is difficult to determine with precision. As regards the cerebral hemispheres, some wasting of the convolutions may be found, but is not present in a very high percentage of subjects. There may be thickening of the pia arachnoid, especially over the vertex. Actual meningitis is not common as a cause of death in the aged.

The endocrine organs do not usually reveal abnormalities on dissection. The supra-renal glands show cortical adenomata at times, but are often autolysed by the time an autopsy is performed. Secondary deposits from carcinoma of the bronchus may also be found in this situation. The thyroid appears normal in the vast majority of cases, both to the naked eye and on histological examination. In the limited experience of the writer, the pituitary has never yet revealed any obvious lesion ; the ovaries appear the same at ninety as they do soon after the menopause ; the testes show little change ; parathyroids always appear normal.

The foregoing account of the morbid anatomy of old age is, of course, far from complete. It has not been possible to discuss the frequency of such lesions as osteo-arthritis, so common in the elderly. Nor has mention been made of the few truly senile diseases, such as temporal arteritis, whose pathology is still being unfolded. Special conditions of the eye and ear remain outside the scope of this chapter. Yet an attempt has been made to describe the common findings at autopsy among aged subjects from a general hospital. It is hoped that this account of the morbid anatomy may be helpful to guide the clinician when faced with the problems of multiple pathology in his elderly patients.

TABLE 33.—*General Causes of Death in Old Age*

Disease	Age over 80	Age 75—80
Cardio-vascular	37%	32%
Cancer...	25%	28%
Digestive	14%	12%
Respiratory	10%	12%
C.N.S.	6%	9%
Urinary	3%	5%
Other sites	5%	3%
	100% = 240	100% = 470 subjects

TABLE 34.—*Lesions causing death in Old Age. (Verified at autopsy)*

Lesion	Age over 80	Age 75—80
Cardio-vascular degeneration	20%	8%
Myocardial degeneration	9%	16%
Carcinoma of colon ...	6%	7%
Bronchopneumonia ...	5%	5%
Cerebral haemorrhage	5%	3%
Peptic ulcers	4%	3%
Carcinoma of stomach	4%	6%
Intestinal obstruction	4%	2%
Coronary thrombosis	3%	4%
Carcinoma of pancreas	3%	1%
Other lesions ...	37%	45%
	100% = 240	100% = 470 subjects

(Total = 710)

CHAPTER XVIII

THE A.B.C. OF GERIATRICS

During the past year, Regional Hospital Boards all over the country have encountered the problem of the aged and chronic sick. Old age is now medical news. The Lumleian lectures at the Royal College of Physicians were a confession that the average physician knows little of disease as found among the aged denizens of a " chronic " hospital. Following the report of a committee set up by the British Medical Association, it has become fashionable to advocate the setting up of " Geriatric Units " to deal with the aged and infirm. This, however, is more easily said than done. There are few doctors with special knowledge of disease in old age : there are no nurses deliberately trained to care for the elderly. In the past, neglect has been the common lot of the chronic sick. This cannot be changed overnight, even by the magic directives of the Minister of Health himself.

Since definition should precede disquisition, let us begin by saying that Geriatrics is more a state of mind than a branch of medicine or a mode of treatment. It is a reaction against the belief that after sixty a patient is too old to be medically interesting or therapeutically rewarding. Nearly all those who hold this faith have, at some point in their career, been suddenly faced with the necessity of providing medical care for a large number of elderly sick or infirm patients. The result of this experience has been similar, whether the subject were originally physician, surgeon, general practitioner, male or female.

The first stage of the Geriatric philosophy is the discovery that the ordinary methods of medicine and surgery can be applied successfully to elderly patients. Once diagnosed, pneumonia can respond to sulphonamides as well at eighty as at eighteen, albeit rather more slowly. Dyspepsia due to a gastric ulcer may occur at seventy-seven and be treated by the same methods as those used for a patient of twenty-seven. Intestinal obstruction in a man of sixty needs the same sort of operation as if it had been found at the age of sixteen. This is the stage of glorious justified optimism which affects brave young men with therapeutic vigour. But after this comes the discovery that everything is not so simple as they had expected. Old age has its problems of degeneration and decay which do not yield to routine methods. The stiff, contorted joints of chronic arthritis need more than heat and salicylates; the chronic bronchitic sufferer wheezes and coughs in spite of elegant expectorant mixtures; the hemiplegic grows flexed and helpless, with red pressure points steadily declining into sloughing bed-sores, no matter what drugs are given. Realisation of this impasse constitutes the second stage of Geriatrics. The third follows naturally—segregation and study. Let the sheep which can be treated successfully get separated from the goats that do not respond. Then concentrate on the latter. It was in this way that Marjory Warren evolved her techniques for managing incontinence and rehabilitating hemiplegia. It was in this way that Cosin and others altered the prognosis of a fractured femur. It was in no other manner that progress was made in treating chronic arthritis at St. John's, Battersea. Collect your cases for comparison, than get down to thought and experiment, trial and error. Eventually one lesson will be learnt at lest—what not to do.

We can see from this description of Geriatric evolution that insistence on active treatment, the desire for classification of patients, painstaking personal attention to small points in management and great persistence are the essentials of those who would care for the aged and chronic sick. Add to this an interest in the methods of physical medicine and occupational therapy, which are so necessary in cases of long-term sickness. Experience of elderly patients who have passed from doctor to doctor and from hospital to hospital will sooner or later evoke the cry " Why didn't we get this case sooner ? " This leads to a wish for contact with the earlier stages of disease. In consequence, the hospital physician will start an out-patient clinic for old folk. After a time he discovers that many elderly sufferers are not able to walk from their homes to the clinic. The natural reaction to this finding is to transport these patients to the hospital by ambulance, so that they too, can have the benefit of out-patient consultation and physiotherapy. This leads, sooner or later, to an interest in the home conditions of elderly people and the social services which can be utilised to assist them.

Almoners, social workers, Red Cross,W.V.S., " meals on wheels" home helps and the like are enlisted to aid those who cannot gain admission to the wards. If the doctor has any curiosity left, he wants to visit the patients in their own homes to see what kind of life they lead. Thus domiciliary visits are eventually added to the services of what was originally a purely hospital unit.

Of course, anyone who is really interested in this sort of work wants to know what other people are doing for their elderly patients. Are there any lessons to be learnt from Cosin or Marjory Warren, for instance ? The budding Geriatric worker starts to visit other units and picks the brains of those in charge. He may beg, borrow or steal quite a lot in this way. The occupational therapy department at the West Middlesex Hospital fills him with envy, the physiotherapy aides trained at Orsett Lodge give him ideas on saving man-power, the remedial exercise classes at St. Helier hint at possible developments. If he joins the Medical Society for the Care of the Elderly, he may see new techniques demonstrated and explained in meetings at Liverpool, Leeds, Redruth and elsewhere. The American journals of Geriatrics and Gerontology introduce him to new world views on old age. In consequence, the care of the elderly and chronic sick, which was once considered a dull, dreary, unrewarding occupation, now becomes an actively advancing branch of medicine, with almost endless possibilities.

Once the doctor has thus become enthusiastic, his nursing staff cannot help getting infected. The old attitude " keep them in bed and keep them quiet " goes by the board. When a ward sister hears of the achievements of Isleworth, Bermondsey or Belmont Road, Liverpool, she wants to see them for herself. A visit to another Geriatric Unit gives her a taste for competition. Local patriotism is aroused and the nurses are stimulated to " keep up with the Joneses ". In this way, the morale of the wards increase and patients formerly considered past treatment are galvanised into activity. After a time, there will be so many cases up and about that the unit looks more like a convalescent home than a place for treating disease. Some of the old folk go back to their families when treatment is finished. Others have no-one to take them, nowhere to go. These patients who do not require treatment accumulate and begin to create a problem of their own by preventing other cases from entering hospital. It becomes essential to dispose of them. A few may be willing to enter the local public assistance institution, but many refuse. So, with the aid of an almoner, the Geriatric physician now has to start the search for an outflow tract through which he can get rid of patients. If there is a branch of the National Old People's Welfare Committee close to the hospital, he is lucky. This body can often assist by finding homes for the elderly and by visiting them. They may run a hostel, but are usually unwilling to admit any person who may break down in health. Still, they are always sympathetic and helpful to those interested in old age.

The pressing need for proper disposal of those whose treatment is finished is one of the consequences of the recent legislation emanating from the Ministry of Health. As yet, no satisfactory solution has been found. Liverpool and London wish to create " half-way houses " in which patients may remain under supervision and be introduced to life outside hospital. Leeds has developed a ring of satellite hostels around the unit. Cornwall uses public assistance accommodation in conjunction with hospital beds, under the auspices of a joint committee. But none of these can be considered as the complete answer to the problem. And until discharge of patients is no longer difficult admission of cases needing treatment cannot be expedited. If we are to overcome this bottle-neck, we must take patients into hospital from their homes at the stage of their disease when it is treatable. It should then be possible to return them whence they came within a relatively short time. Early diagnosis and prompt therapy are the only insurance against masses of bedfast old folk blocking hospital and institution beds for years on end. It is the old adage that a stitch in time saves nine which must now be applied to Geriatrics.

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